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(71) Applicant: KEPNER–TREGOE, INC. [US/US]; 17 Research Road, Princeton, NJ 08542 (US).

(72) Inventors: SCHLICK, James, D.; 561 Heatons Mill Drive, Langhorne, PA 19047 (US). LONGMAN, Andrew, D.; 11 Fifth Street, Frenchtown, NJ 08825 (US). ALVAREZ, Betsy, L.; 12 Lakeside Road, Somerset, NJ 08873 (US). HUMMEL, Matt; Suite A, 12910 Culver Boulevard, Marina del Rey, CA 90066 (US). LEE, Sandra; Suite A, 12910 Culver Boulevard, Marina del Rey, CA 90066 (US). SANTOS, Jad; Suite A, 12910 Culver Boulevard, Marina del Rey, CA 90066 (US). SERRANO, Chris; Suite A, 12910 Culver Boulevard, Marina del Rey, CA 90066 (US). DINH, Phong; Suite A, 12910 Culver Boulevard, Marina del Rey, CA 90066 (US). CLINE, Rachel; Suite A, 12910 Culver Boulevard, Marina del Rey, CA 90066 (US). BERNER, Rich; Suite A, 12910 Culver Boulevard, Marina del Rey, CA 90066 (US). MCLANE, Jennifer; Suite A, 12910 Culver Boulevard, Marina del Rey, CA 90066 (US). RONO, Ramon; Suite A, 12910 Culver Boulevard, Marina del Rey, CA 90066 (US). MENTZ, Lisa; Suite A, 12910 Culver Boulevard, Marina del Rey, CA 90066 (US). GELLER, Josh; Suite A, 12910 Culver Boulevard, Marina del Rey, CA 90066 (US). GERY, Gloria; 108 South Trail, Tolland, MA 01034–9403 (US). YARDUMIAN, Robert; Suite A, 12910 Culver Boulevard, Marina del Rey, CA 90066 (US). SCHAPIRO, David; Suite A, 12910 Culver Boulevard, Marina del Rey, CA 90066 (US). BUSSARD, Katherine, Nicole; Suite A, 12910 Culver Boulevard, Marina del Rey, CA 90066 (US). LAU, Catherine; Suite A, 12910 Culver Boulevard, Marina del Rey, CA 90066 (US). OSBORNE, Kevin; Suite A, 12910 Culver Boulevard, Marina del Rey, CA 90066 (US). CONNELLY, Sean; Suite A, 12910 Culver Boulevard, Marina del Rey, CA 90066 (US). NGUYEN, Kevin; 10317 Orr and Day Road, Santa Fe Springs, CA 90670 (US). WILMSMEYER, Justin; 8957 Gibson Street, Los Angeles, CA 90034 (US). VERNON, Martin; 3701 Overland Avenue #B223, Los Angeles, CA 90034 (US). HOGQUIST, Karl; 849 E. Victoria Street #612, Carson, CA 90746 (US). SCHWARZBART, Joel; Romac International, 15260 Ventura Boulevard #380, Sherman Oaks, CA 91403 (US).

(74) Agents: MORIARTY, Gordon, R. et al.; Weingarten, Schurgin, Gagnebin & Hayes LLP, Ten Post Office Square, Boston, MA 02109 (US).

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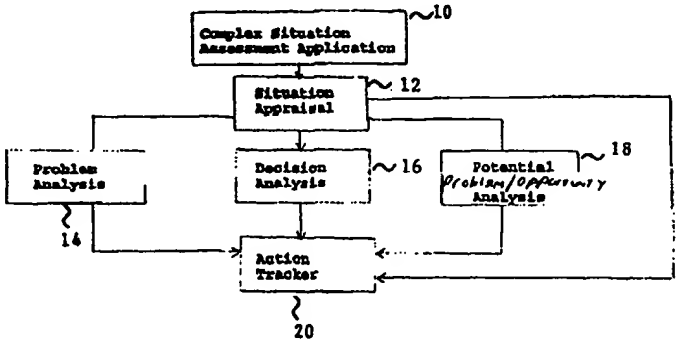

(57) Abstract

A computer software application, graphical user interface, and method for entering information concerning a complex business situation (16), refining such information in a stepwise manner through the interface, generating a list of effective actions for addressing such a business situation, and storing such information in a knowledge base adapted for future query and reporting use of such a complex business situations (16), is provided. A set of screen sequences (14, 16, 18) allows entry of specific aspects of such a situation to generate an action list. A situation appraisal sequence allows entry of concerns stemming from the situation to prioritize such concerns. A problem analysis sequence (14) allows entry of causes of a problem, and refining the causes to determine a true cause. A decision analysis sequence (14) allows entry of alternatives concerning a decision, and refines such alternatives to determine one which suits the objective.

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METHOD AND APPARATUS FOR PROBLEM SOLVING, DECISION MAKING, STORING, ANALYSING, RETRIEVING ENTERPRISEWIDE KNOWLEDGE AND CONCLUSIVE DATA

CROSS REFERENCE TO RELATED APPLICATIONS

This application claims priority under 35 U.S.C. §119(e) to U.S. Provisional Patent Application No. 60/091,476, filed July 2, 1998, entitled ELECTRONIC TOOL, and U.S. Provisional Patent Application No. 60/133,746, filed May 12, 1999, entitled ELECTRONIC TOOL, both incorporated herein by reference.

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BACKGROUND OF THE INVENTION

Modern business enterprises must address issues surrounding the business in a systematic, often time-driven, manner. Such business enterprises typically have an organizational structure, often of a hierarchical or matrix form, to define the various groups of individuals responsible for a particular area of the business. Often a particular issue evokes different concerns from different groups, resulting in differing definitions of a problem to be addressed. Further, individuals within the groups may not have the knowledge, or expertise, to effectively

address a particular problem or decision, due to factors such as inexperience or lack of longevity in a particular role.

Lines of communication can become blurred when individuals assume they share a common understanding of a problem. The notion of a problem surrounding a complex situation can have different meanings to different groups or individuals within the business enterprise. The term "problem" is often used indiscriminately to define factors such as a complex situation requiring action, a malfunction or error, the cause of a malfunction or error, a difficult choice, or future trouble. Each of these concerns requires different action, yet all elements may be common to a particular situation. Prior to implementing action, such a situation must be broken down into a manageable set of issues which require action, and which can be verified as the correct set of issues which will resolve the situation.

Effectively addressing the issues presented by such a complex situation, therefore, requires clarification of the exact issues to be acted upon. However, as indicated above, different groups and/or individuals have different needs, and each may have a different definition of the problem, depending on how the complex situation affects the responsibilities of that group and/or individual. Further, employment terminations, transfers, and organizational changes can result in a lack of individuals with expertise and experience concerning such a complex situation. Such factors can cause a business enterprise to implement ineffective actions, perform duplicative acts, or even to implement actions which exacerbate the situation.

It would be beneficial to provide a computer software program adapted to provide an interactive interface to receive information surrounding such a complex situation, display such information in a format which allows the user to refine issues in a stepwise manner, and store such information, including both the solution or resolution and

the thought processes that created them, for subsequent query and retrieval by multiple users for addressing future such complex situations.

BRIEF SUMMARY OF THE INVENTION

A computer software application, graphical user interface (GUI), and method for entering information concerning a complex business situation, refining such information in a stepwise manner through such an interface, generating a list of effective actions for addressing such a business situation, and storing such information in a knowledge base adapted for future query and reporting use for such complex business situations, is provided. A set or sequence of process screen structures allows entry of specific aspects of such a situation to generate such an action list. Such process screen sequences provide a systematic method to gather and organize information effectively in order to resolve a complex situation, and to store such information in a knowledge base for later query and retrieval for the same or similar situations, thereby preserving enterprisewide knowledge and expertise. An action tracker interface is also provided which provides task management and monitoring of the various actions determined by the process screen sequences. The user has the ability to access the process screens in a non-linear mode and can toggle between interview and worksheet modes described further below.

A situation appraisal process screen sequence provides a starting point in assessing a complex or ill-defined business situation. An interface for entering concerns presented by such a situation is presented to a user, and allows prioritization and categorization of such concerns. In this manner a user determines which concerns should be addressed first, and whether these concerns present a problem to be resolved, a decision to be made, or a potential problem which could result from a present plan or

decision. A list of actions to be undertaken by groups or individuals is defined through the action tracker interface to address the prioritized concerns, and includes an indication of which of the other process screen sequences should be undertaken: problem analysis, decision analysis, and/or potential problem/opportunity analysis.

A problem analysis process screen sequence provides an interface for entering information surrounding the problem in a selectively sequential, orderly manner, and for entering possible causes for the problem by drawing on the experience of the user and the knowledge base of past situations. Possible causes are then evaluated and eliminated in a prioritized manner to determine which possible cause explains the facts presented by the problem, and confirmed to be the true cause by verifying any questionable information pointing to the most probable cause. Actions and tasks needed to be undertaken to verify the most probable cause are assigned and monitored through the action tracker interface.

A decision analysis process screen sequence provides an interface to allow entry of a PURPOSE OF A DECISION based on specific lists of results sought, and entering alternatives which might satisfy each result. Alternatives are then considered with respect to each result. Various risks associated with each alternative are entered, and are ranked based on magnitude and probability. A decision choice is then determined by scrolling through and balancing the alternatives and risks. A decision analysis may be undertaken based on a situation appraisal, may be used to assess several possible causes resulting from a problem analysis, or may be undertaken independently. Actions needed to implement the decision are then entered and tracked using the action tracker interface.

A potential problem/opportunity analysis process screen sequence provides an interface to assess and determine actions to mitigate or eliminate future possible

problems and capitalize on opportunities which may arise during implementation of decisions and plans. This process screen sequence may be undertaken as indicated by a situation appraisal, may be used to evaluate a decision indicated by a decision analysis, or may be undertaken independently. Possible future problems or opportunities are identified and entered, and likely causes of each future problem are identified. Preventative actions which serve to reduce the likelihood of occurrence of each of the future problems are developed by scrolling through the likely causes, and contingent actions which may mitigate the result should the future problem occur despite the preventative action are also entered. Tasks required to implement the preventative actions and contingent actions are then entered and tracked using the action tracker interface.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING

The invention as defined herein will be more fully understood by reference to the following drawings and detailed description of the drawings, of which:

Fig. 1 shows a top level functional block diagram;

Fig. 2 shows a system architecture block diagram;

Fig. 3 shows a flowchart of the situation appraisal process screen sequence;

Fig. 4 shows a flowchart of the problem analysis process screen sequence;

Fig. 5 shows a flowchart of the decision analysis process screen sequence;

Fig. 6 shows a flowchart of the potential problem analysis process screen sequence;

Fig. 7 shows the LIST THREATS AND OPPORTUNITIES screen of the Situation Appraisal screen sequence;

Fig. 8 shows the SEPARATE AND CLARIFY CONCERNS screen of the Situation Appraisal screen sequence;

Fig. 9 shows the CONSIDER SERIOUSNESS, URGENCY AND GROWTH screen of the Situation Appraisal screen sequence;

Fig. 10 shows the DETERMINE ANALYSIS NEEDED screen of the Situation Appraisal screen sequence;

Fig. 11 shows the DETERMINE HELP NEEDED screen of the Situation Appraisal screen sequence;

Fig. 12 shows the STATE THE PROBLEM screen of the Problem Analysis screen sequence;

Fig. 13 shows the SPECIFY THE PROBLEM screen of the Problem Analysis screen sequence;

Fig. 14 shows the USE DISTINCTIONS AND CHANGES screen of the Problem Analysis screen sequence;

Fig. 15 shows the STATE POSSIBLE CAUSES screen of the Problem Analysis screen sequence;

Fig. 16 shows the TEST POSSIBLE CAUSES AGAINST SPECIFICATION screen of the Problem Analysis screen sequence;

Fig. 17 shows the DETERMINE THE MOST PROBABLE CAUSE screen of the Problem Analysis screen sequence;

Fig. 18 shows the GATHER FACTS TO VERIFY THE TRUE CAUSE screen of the Problem Analysis screen sequence;

Fig. 19 shows the THINK BEYOND THE FIX screen of the Problem Analysis screen sequence;

Fig. 20 shows the STATE THE DECISION screen of the Decision Analysis screen sequence;

Fig. 21 shows the DEVELOP OBJECTIVES screen of the Decision Analysis screen sequence;

Fig. 22 shows the CLASSIFY OBJECTIVES INTO MUSTS AND WANTS screen of the Decision Analysis screen sequence;

Fig. 23 shows the WEIGHT THE WANTS screen of the Decision Analysis screen sequence;

Fig. 24 shows the GERNERATE ALTNERATIVES screen of the Decision Analysis screen sequence;

Fig. 25 shows the SCREEN ALTERNATIVES THROUGH THE MUSTS screen of the Decision Analysis screen sequence;

Fig. 26 shows the COMPARE ALTERNATIVES AGAINST THE WANTS screen of the Decision Analysis screen sequence;

Fig. 27 shows the IDENTIFY ADVERSE CONSEQUENCES screen of the Decision Analysis screen sequence;

Fig. 28 shows the MAKE THE BEST BALANCED CHOICE screen of the Decision Analysis screen sequence;

Fig. 29 shows the IMPLEMENT DECISION screen of the Decision Analysis screen sequence;

Fig. 30 shows the DEVELOP A PLAN screen of the Potential Problem Analysis screen sequence;

Fig. 31 shows the LIST POTENTIAL PROBLEMS screen of the Potential Problem Analysis screen sequence;

Fig. 32 shows the ASSESS THREATS screen of the Potential Problem Analysis screen sequence;

Fig. 33 shows the CONSIDER LIKELY CAUSES screen of the Potential Problem Analysis screen sequence;

Fig. 34 shows the TAKING PREVENTATIVE ACTION screen of the Potential Problem Analysis screen sequence;

Fig. 35 shows the TAKING CONTINGENT ACTION screen of the Potential Problem Analysis screen sequence;

Fig. 36 shows the MODIFY PLAN screen of the Potential Problem Analysis screen sequence;

Fig. 37 shows the ACTION TRACKER screen;

Fig. 38 shows the situation appraisal knowledge base ER diagram;

Fig. 39 shows the problem analysis knowledge base ER diagram;

Fig. 40 shows the decision analysis knowledge base ER diagram;

Fig. 41 shows the potential problem analysis knowledge base ER diagram;

Fig. 41a shows the potential opportunity analysis base ER diagram;

Fig. 42 shows the action tracker knowledge base ER diagram;

Fig. 43 shows the general process screen sequence class inheritance graph;

Figs. 44a-44c show the situation appraisal class inheritance graph;

Figs. 45a-45d show the problem analysis class inheritance graph;

Fig. 46 shows the decision analysis class inheritance graph;

Fig. 47 shows the potential problem analysis class inheritance graph;

Fig. 47a shows the potential opportunity analysis class inheritance graph;

Fig. 48 shows the action tracker class inheritance graph;

Fig. 49 shows the DEVELOP A PLAN screen of the Potential Opportunity Analysis screen sequence;

Fig. 50 shows the LIST POTENTIAL OPPORTUNITIES screen of the Potential Opportunity Analysis screen sequence;

Fig. 51 shows the ASSESS BENEFITS screen of the Potential Opportunity Analysis screen sequence;

Fig. 52 shows the CONSIDER LIKELY CAUSES screen of the Potential Opportunity Analysis screen sequence;

Fig. 53 shows the TAKING PROMOTING ACTION screen of the Potential Opportunity Analysis screen sequence;

Fig. 54 shows the TAKING CAPITALIZING ACTION screen of the Potential Opportunity Analysis screen sequence;

Fig. 55 shows the MODIFY PLAN screen of the Potential Opportunity Analysis screen sequence;

Fig. 56 shows a GUI screen indicative of the top-level menu as illustrated in Fig. 1;

Figs. 57-73 show an alternative embodiment of the GUI screens of the situation appraisal process screen sequence;

Figs. 74-84 show a first alternative embodiment of the GUI screens of the problem analysis process screen sequence; and

Figs. 85-137 show a second alternative embodiment of the GUI screens of the problem analysis process screen sequence.

DETAILED DESCRIPTION OF THE INVENTION

The top level functional block diagram of the complex situation assessment process screen sequences 10 as defined herein is shown in Fig. 1. Situation appraisal 12 is typically most applicable to an initial assessment and enumeration of concerns surrounding a situation. This appraisal results in an indication of which of the process screen sequences, problem analysis 14, decision analysis 16, or potential problem/opportunity analysis 18, is most applicable to a particular concern. Each of the three analysis process screen sequences 14, 16, 18 may also be invoked independently irrespective of a corresponding situation analysis. Action tracker interface 20 is available from all process screen sequences, and may also be invoked independently.

Fig. 2 shows an architectural block diagram of the system in which the situation assessment process screen sequences are invoked. Software architecture 23 as included, for example, in workstation 22 includes the process components 24 which comprise the situation appraisal, problem analysis, decision analysis, and potential problem/opportunity analysis software which drive the process screen sequences. Action tracker component 26 comprises software driving the action tracker, accessible from any of the process screen sequences. Knowledge base access and retrieval of prior situation assessment activities are performed by report writer component 28, for broad queries and retrieval of large quantities of data, and keyword query or other searching component 30, for pinpointing specific entities and situations. Other support and administrative functions are provided by

licensing management component 32, system support component 34, and administrative component 36.

Workstation 22 is networked to remote users 38, for enterprisewide access at remote locations, and local network server 40, for accessing the knowledge base 42 to store and retrieve prior situation assessment data. Archive database 44 and client database 46 are for backup functions and enterprise specific information, respectively.

The software as described above is executed on a device such as workstation 22. In this embodiment, workstation 22 is a 32 bit microprocessor-based system such as a PENTIUM® PC and executes on a WINDOWS® (94, 98, or NT) platform or other operating system as compiled. 16 bit users may utilize commercially available extensions for use on older PCs. 32M main memory is recommended, however execution may be possible with less memory with lower performance.

The process screen sequences defined further below are point and click WINDOWS®-type graphical user interfaces common to many computer applications. Screens are scrolled through using common scroll arrow buttons, and pull-down menus may be used to jump between various screens in a particular screen sequence. A user may begin with any process screen sequence, also through a pull-down menu, although it is expected that a situation appraisal will precede one or more of the other process screen sequences. Each process screen sequence is identified by a unique process identifier or file name for later retrieval and knowledge base entry. Entry cells are either for free form entry of descriptive text, or pull-down menus to populate the field from among a list of finite choices. A user may elect either a worksheet mode or interview mode of operation. Worksheet mode is for the experienced user, and allows unprompted entry of data into the relevant fields to expedite the assessment. Interview mode is a more

structured environment which prompts the user with specific questions to elicit the proper type of data from the user. While slightly more time consuming, this mode allows a novice to produce an accurate assessment until the user is comfortable with worksheet mode. Modes may be toggled at any time. Information input by the user during interview mode is incorporated into the corresponding worksheet and vice-versa. Each of the process screen sequences outlined above are organized into deliverables called Process Application Kits (PAKs), which can be independently provided. Further, each PAK can be customized to suit a particular business focus or group of users through the COM object architecture (per MICROSOFT® Component Object Model). Additional PAKs can be developed to access the knowledge base accumulated with the process screen sequences, for example to generate project specific reports or to generate periodic reports about critical items. Throughout the process screen sequences, process checkers running in the background screen and filter data which is input by the user, thereby ensuring that complete and correct data is provided by the user throughout each screen sequence. These process checkers analyze the user input at various input points, and detect items which are likely to require refinement or correction. Constructively phrased messages are provided to the user to assist in proper correction of data entry, or to confirm that the input data is correct, along with corresponding prompts for response. In one embodiment, three process checkers are implemented, however additional checkers could be implemented to suit particular types of errors as the user base requires. Further, process checker messages may be toggled off by experienced users who do not require such assistance. An INFORMATION MISSTATED process checker employs rule-based analysis of input to detect skipped steps, unsound data, or incomplete analysis. Such messages are typically displayed as the

user attempts to advance to a next screen, after completing entry on the current screen, however could also be provided upon entry of a particularly suspect cell. A COMMON PITFALLS process checker flags areas where imprecise data will result in later difficulty, as with critical data items. Such messages are displayed prior to user input as a reminder, and do not analyze data after entry. A SHARPENER process checker assists in entry of critical fields where further prompting assists in refining the response. A series of questions is presented to the user to assist in editing the response entered in the cell. This process checker, therefore, guides the user through a series of successively narrower questions in order to pinpoint accurately the desired item of information. All process checkers may be overridden by the user once confirming that the response entered is in fact correct.

Cells as presented by the process screen sequences defined herein may be populated via direct text entry from the keyboard, or may be populated and/or supplemented by attaching an external file. These files are stored in the knowledge base and remain associated with the particular cell or record. Such files may be MICROSOFT® Word Documents, POWER POINT® files, jpegs, bitmaps, AUTOCAD® files, or other external file appropriate to the particular cell.

Flowcharts for exemplary situation appraisal, problem analysis, decision analysis, and potential problem analysis process screen sequences are shown in Figs. 3-6. Each of the steps in the flowcharts corresponds to a specific screen in the sequences described in further detail below. Specifically, Fig. 3 shows a situation appraisal flowchart 50; Fig. 4 shows a problem analysis flowchart 52; Fig. 5 shows a decision analysis flowchart 54, and Fig. 6 shows a potential problem analysis flowchart 56.

Software architecture is based upon various third-party toolkits and development platforms consistent with modern industry development standards to facilitate modifications and extensions. Unified Modeling Language (UML) is employed to standardize the object-oriented architecture. COM objects are provided where appropriate, to facilitate integration and modification. Rational Rose Modeler for software design, ERWin® for database modeling, and Delphi Client/Server are used to facilitate future enhancements.

SITUATION APPRAISAL

The situation appraisal screen sequence 50 provides a user interface which allows a situation to be subdivided into a set of specific concerns so that a user may graphically organize and clarify issues to be resolved. Each situation is stored in an individual situation file for later retrieval and database indexing. A situation background and theme are also provided to set the general business context and to be used as a reference or refresher for later querying and retrieval.

Once the situation file is created, the threats and opportunities screen, shown in Fig. 7, is then used to enter broad issues relating to general concerns of the situation. Users enter descriptive text for each broad issue in concern cells 100, which scroll downward to accommodate all the broad issues entered. Once complete, the ADVANCE SEQUENCE arrow button 102 is used to progress to the separate and clarify concerns screen shown in Fig. 8. Users then consider the broad issues entered in the previous screen, and clarify and refine them into distinct concerns in refined concern cells 104, removing redundant items and consolidating overlapping issues. When the modified list describes distinct refined concerns, rather than broad issues, ADVANCE SEQUENCE arrow 102 is used to progress to the concern consideration screen.

The concern consideration screen shown in Fig. 9 allows a user to enter specific information for each of the stored refined concerns 104 stemming from a particular situation, as listed on the separate and clarify concerns screen. This provides an interface to populate various cells addressing the seriousness 106, urgency 108, and growth 110, defined further below, of a particular situation, thereby allowing computation of a priority 112 for that concern. The CONCERN CONSIDERATION screen is used to refine details of each concern. Some of these cells are further subdivided into a specification, for descriptive text, and a relativity field, for ranking relative to other concerns.

The priority cell 112 is computed based on the relativity fields for seriousness, urgency, and growth, described further below, to provide an overall ranking of concerns. Alternatively, this cell may be overridden by the user through priority pull-down 112.

The SERIOUSNESS cell 106 is further divided into a specification cell 126 and a relativity cell 116. Users enter descriptive text in the specification cell 126 to describe the impact the concern in question will have with respect to human resources, safety, cost, customers, productivity, reputation, and other factor which affect the enterprise. The seriousness relativity cell 116 is for entering a discrete ranking of magnitude relative to the seriousness of other concerns. A ranking hierarchy such as high (H), medium (M), low (L), and need more data (NMD) can be entered here through a pull-down menu similar to the priority cell, and will be displayed as well as used in calculating priority.

The URGENCY cell 108 also has two components, a specification cell 128 and a relativity cell 118. The urgency specification cell 128 is for descriptive text directed to determining when resolution of this concern would become difficult, expensive, or impossible. The

urgency relativity cell 118 is for entering a discrete ranking of magnitude relative to the urgency of other concerns, similar to the priority cell pull-down.

The GROWTH cell also has specification and relativity components. Specification cell 130 is for descriptive text directed to determining the evidence that the seriousness of the concern will grow. The growth relativity cell 120 is for entering a discrete ranking relative to growth potential of other concerns, similar to the priority cell pull-down. High (H) indicates that the growth potential is increasing, medium (M) indicates that the growth potential is stable, and low (L) indicates that growth is decreasing. Need more data (NMD) may also be entered.

Once all concerns 104 relevant to the situation are entered, screen sequence button 102 is used to advance to the determine analysis needed screen in Fig. 10. For each concern entered, five clarifying cells are provided: PRIORITY, SERIOUSNESS, URGENCY, GROWTH, and PROCESS. Each concern cell entered on the previous screen is displayed, along with a PROCESS cell 140 for each concern. PROCESS cell also has specification 144 and a relativity components 142. Process relativity cell 142 is for entering the specific process sequences, described further below, that should be used to address each concern, and is selected by pull-down menu 146. A problem analysis sequence should be undertaken if the concern is directed to the cause of why a particular event or occurrence happened. A decision analysis sequence should be undertaken if the concern is directed to determining the course of action that should be pursued to address the concern. A potential problem analysis should be undertaken if the concern is directed to predicting future occurrences or events and possible remedial action to be taken. A further situation appraisal should be undertaken if the concern is too broad to be adequately addressed by the problem, decision, or potential problem analysis sequences.

After an analysis is selected for each concern, the DETERMINE HELP NEEDED screen (Fig. 11) is used to identify specific individuals or groups to execute the analysis determined in the previous screen and to identify the specific objective of the analysis. The DETERMINE HELP NEEDED screen has a PROCESS section 150, which echoes information from the DETERMINE ANALYSIS screen, and an ASSIGNMENT section 152, for specifying involvement of other people. The ASSIGNMENT section 152 is integrated with the action tracker, described further below, which provides scheduling for all screen sequences. ACTION cell 154 is used to enter descriptive text for the task and objective. This task is generally an "analysis" from the determine analysis screen, or other task for addressing a particular concern. WHO cell 156 is a pull-down menu of names for assignment to the analysis, and also allows for entry of new names. WHEN cell 158 indicates the completion date of the analysis. NOTES cell 160 is a descriptive text cell which can contain clarifying or specification information of the analysis, such as product, assembly line, or plant location. STATUS cell 162 is used to describe the current state of the task, and is a pull-down with the options not started, action assigned, cancelled, on hold, cause confirmed. Other status cell values may be entered. Sort pull-down 164 allows sorting by any of the ASSIGNMENT section cells. The result of this process screen sequence is that the user is provided with an indication of which of the analysis process screen sequences, problem, decision, or potential problem, are most applicable to the concern in question, as described further below.

PROBLEM ANALYSIS

The problem analysis screen sequence provides a user interface which allows a problem to be subdivided into a set of statements which describe various aspects of the problem and what they are and are not, creating a concise,

accurate problem specification. These statements are then assigned possible causes. The possible causes are then evaluated to determine the most probable cause and verify the most probable cause to determine of it is the true cause.

A problem background statement concerning the context is read from the situation appraisal file to which this problem analysis corresponds. This statement may be edited by the user or alternately, entered entirely by the user. This problem background statement is then stored in an individual problem analysis file for later retrieval and database indexing.

Referring to Fig. 12, the STATE THE PROBLEM screen is used to enter a statement of normal operation in the SHOULD BE HAPPENING cell 200 to describe what the object of the problem should be doing when performing properly. ACTUALLY HAPPENING cell 202 is then used to enter a perceived problem, which is the current condition of the object that is believed to be, or have, the problem. User then selects the applicable cause known/unknown button. If the cause is known, button 211 is selected, and the user is prompted that a problem analysis is not appropriate and an alternate screen sequence, such as decision analysis, may be applied. If the cause is not known, button 210 is selected, and the object of the problem is then entered in OBJECT cell 206, such as "motor", "assembly line five", or "Boston office". The DEVIATION cell 208 is used to enter the deviation from normal operation, such as "cracked housing" or "sales down ten percent".

The user then advances to the SPECIFY THE PROBLEM screen, for example as shown in Fig. 13, to enter specific statements of fact concerning the problem. A concise problem statement 212 from the object 206 and deviation 208 cells is carried over from the previous screen, and is the concatenation of the object and deviation cells to form a statement such as "Boston office sales down ten percent."

Eleven descriptor question cells 214 are provided (not all shown due to scroll down display), however fewer or additional statement cells could also be used. Collectively, these descriptor question cells are for describing the problem in terms of four domains: what, where, when, and extent. The eleven descriptor question cells 214 are for entering information to address the following: problem object, problem deviation, geographical variance or location, location of the deviation on the problem object, first problem (deviation) occurrence, most recent or subsequent problem (deviation) occurrence, problem cycle (during lifecycle history of object), number of problem objects (how many objects have/do not have the deviation), size of problem (magnitude of a single deviation), number of problem deviations (how many deviations on each object), and problem trend (how it is/is not progressing). For each descriptor cell, two subfields are provided. In each subfield, for each of the eleven descriptors, the user enters descriptive text directed to what the problem is 216 and is not 218. The IS descriptor subfield is for accurately refining and narrowing the object that has the deviation. The IS NOT descriptor subfield is for indicating which other closely related entities could have the deviation, but do not. By defining both the IS and IS NOT subfields, the responses in these cells serve to establish clear boundaries around the problem. Additional descriptor question cells for a particular descriptor question may be added by clicking on insert button 220 if needed to accurately refine the problem. For example, WHAT OBJECT descriptor 222 might further clarify specific product packaging that is and is not experiencing the deviation, and also might indicate which assembly lines are affected. Other comparative designators may be used in place of "is" and "is not".

Following entry of the IS/IS NOT descriptor cells, the user advances to one of two screens. The user may advance

to the USE DISTINCTIONS AND CHANGES screen shown in Fig. 14, which provides cells for entering distinctions between each of the IS/IS not descriptors entered previously. These distinction fields assist in entering possible causes (Fig. 15). Alternatively, if the user prefers using their own knowledge and experience, they may advance directly to the STATE POSSIBLE CAUSES screen.

The USE DISTINCTION AND CHANGES screen (Fig. 14) presents the user with the previously entered problem statement 212 and descriptor question cells 214, and provides, for each descriptor question, DISTINCTION 224 and CHANGE 226 cells. These DISTINCTION and CHANGE cells are for entering descriptive text to identify the distinctive features concerning the "IS" data 216 relative to the "IS NOT" data 218, for each of the descriptor questions 214. The information in these cells assists in identifying possible causes in the subsequent state possible causes screen (Fig. 15). Users enter distinctive features for each is/is not pair in DISTINCTION cells 224. Multiple distinctive features may be entered by clicking insert button 228 to insert a DISTINCTION cell. Not all descriptor IS/IS NOT cells need be populated, however a distinction may not be entered unless the corresponding descriptor question cells are populated. Descriptor IS/IS NOT cells may be entered here as well.

For each DISTINCTION cell 224, descriptive text concerning changes are entered in CHANGE cells 226. Such changes may be those that have occurred in, on, around, or about each distinction, in order to identify possible causes. Other changes may also be used. As with DISTINCTIONS 224, multiple change cells may be entered for each distinction by clicking the INSERT CHANGE button 230.

The user next advances to the STATE POSSIBLE CAUSES screen shown in Fig. 15. This screen has two formats depending on whether the user has elected to enter distinctions and changes. Fig. 15 shows the STATE POSSIBLE

CAUSES screen with the DISTINCTION and CHANGE cells 224, 226 echoed. If the user has not entered distinctions and changes, the descriptor question cells 214 and IS/IS NOT responses 216, 218 are displayed. For either screen descriptive text is entered in possible CAUSE cells based upon the information in the DISTINCTION/CHANGE cells 224, 226 or is/is not responses 216, 218, as applicable. The most effective possible causes tend to be provided by cross-correlating the eleven different descriptor questions to find common denominators and items which are mutually exclusive. Additional possible cause cells may be added through INSERT POSSIBLE CAUSE button 234.

Upon entry of POSSIBLE CAUSE cells 232, the user advances to the test possible causes against specification screen shown in Fig. 16. This screen presents possible causes one at a time in POSSIBLE CAUSE cell 236. The possible cause selection buttons 238 are used to scroll through the list of previously entered possible causes. The problem statement 212 is echoed here, as well as the descriptor questions 214 and responses 216, 218. A CONDITIONS 240 cell and an ASSUMPTIONS cell 242 are provided for user input. For each possible cause 236, users scan the list of descriptor questions 214. For each descriptor question, conditions 240 under which the possible cause would prove or disprove the descriptor question are entered. Conditions are entered under prefixes such as "ONLY IF", "YES BECAUSE", and "NO BECAUSE" via condition pull-down 244. Assumptions pertinent to the basic condition are then entered in ASSUMPTIONS/NOTES cell 242. An "ONLY IF" assumption specifies the specific circumstances under which the possible cause would explain the particular descriptor question 214. A "YES BECAUSE" assumption explains why the possible cause would explain the particular descriptor question. A "NO BECAUSE" assumption explains why the possible cause could not explain the particular descriptor question 214, and

eliminates the possible cause 236 from the list. Conditions may be limited to three options to facilitate later sorting and processing of the possible causes to determine the true cause or causes, described below. Such an eliminated possible cause, however, and the associated assumption, is nonetheless retained in the knowledge base for subsequent queries, described further below with respect to the knowledge base query engine. Multiple ASSUMPTIONS/NOTES cells 242 needed to explain a particular descriptor question may be entered through INSERT ASSUMPTION button 246.

Following the entry of conditional assumptions, positive cause notes, and elimination of a subset of the causes, the DETERMINE MOST PROBABLE cause screen is called (Fig. 17). At this point the list of possible causes has been narrowed due to elimination of the possible causes resulting in a "NO BECAUSE" condition test, above. This screen presents remaining assumptions entered on the TEST POSSIBLE CAUSES screen (Fig. 16) in an ASSUMPTION cell 242, alongside the corresponding POSSIBLE CAUSE cell 236. For a listed possible cause, probability pull-down 247 may be used to assign a probability cell 248 from among: MPC (most probable cause, high (consider next), medium (also verify) and low (consider later). The ASSUMPTION cells 242 and POSSIBLE CAUSE cells 236 are sorted according to the probability 248 and the condition (244, Fig. 16) for use in the next screen.

The GATHER FACTS TO VERIFY THE TRUE CAUSE screen (Fig. 18) is then presented. Low probability possible causes are not carried over onto this screen, however such causes and assumptions are nonetheless stored in the knowledge base for later query use. The remaining possible causes and their respective assumptions are displayed in their respective cells 236, 246. Individual possible causes are considered by the user in a scrolling format which allows the user to advance through scroll buttons 248 from most

probable to the "ALSO VERIFY" possible causes. For each possible cause 236 presented, ACTION TRACKER cells 250 are used to enter actions needed to resolve the possible cause 236 and the accompanying assumptions 246. ACTION cell 252 is for descriptive text indicative of the specific test, activity, or question to be undertaken in order to confirm or deny a particular possible cause and the assumptions associated therewith. WHO cell 254 is for indicating the person or group responsible for the action, and WHEN cell 256 is for a completion date. NOTES cell 258 allows entry of descriptive text concerning other aspects of the action.

ACTION TRACKER cells 250 are integrated with the action tracker, described further below, which is integrated with the other process screen sequences as defined herein. In this manner, a concise itemization of the actions required to address a particular possible cause can be entered, stored in the knowledge base, and later searched and retrieved through the query engine, in addition to being codified for tracking the present problem. The query engine, described further below, may also be invoked to search for similar possible causes in the knowledge base. Resolution of the action items should then focus and refine the remaining possible causes to determine the true cause.

Fig. 19 shows the THINK BEYOND THE FIX SCREEN for entering data to enumerate ramifications of the actions just entered. This information may be useful in the potential problem analysis process screen sequence, described further below.

DECISION ANALYSIS

A situation appraisal, as described above, may also indicate that a decision analysis is warranted. A decision analysis, as described further below, allows a user to populate cells specifying objective aspects of the decision, and use these cells for reporting and querying of

the knowledge base to provide a graphical verification and record that all aspects concerning a particular decision were considered. The screens presented in the decision analysis screen sequence allow a user to populate cells focused on the objective of the decision, the alternatives which strive towards achieving that objective, risks associated with each alternative, and on selecting the final decision from among the alternatives.

Each decision analysis screen sequence is stored in a unique file to facilitate later indexing, searching and retrieval from the knowledge base. A previous or in process decision analysis can be selected for modification by the user, or a new decision analysis screen sequence may be entered.

Referring to Fig. 20, the STATE THE DECISION screen is shown. The DECISION BACKGROUND cell 300 is for descriptive text concerning the context and other data about the situation. Alternatively, this cell may be populated from a situation appraisal or action tracker sequence which raised this decision analysis. Next, a DECISION STATEMENT is entered in the decision statement cell 302. The decision statement should clarify the fundamental purpose of the decision, the intended result, and should set the scope of boundaries of the alternatives which will be considered. An overly broad decision statement may purport to provide a far reaching solution, but may also prove difficult to enumerate alternatives for, as will be described below, and may not provide informative value during future queries of the knowledge base.

Once the decision statement is entered, the user advances to the DEVELOP OBJECTIVE screen (Fig. 21). The DECISION STATEMENT cell 302 is echoed here, and additional cells for objectives 304 and notes 306 are provided. An INSERT OBJECTIVE button 308 allows entry of additional objectives. Using the DECISION STATEMENT 302 as a reference, the user enters descriptive text in the

OBJECTIVES cells 304 to indicate particular results to be achieved. Objectives, both short and long term and of varying priorities and constraints, are entered at this point to robustly populate the knowledge base. The criteria to measure the objective should be clear. Refinement occurs at a later screen. Notes concerning constraints, priority, or other aspects concerning this objective may be entered in NOTES cell 306.

After listing the objectives, the CLASSIFY OBJECTIVES screen, shown in Fig. 22, is displayed. This screen echoes the DECISION STATEMENT 302, and lists each OBJECTIVE and NOTES cell 304, 306 for review by the user. For each objective, a CLASSIFICATION cell 310 is provided. The user scans the objectives, and for each listed objective enters a classification of MUST or WANT, or other descriptive classification, in CLASSIFICATION cell 310 using pull-down menu 312. Objectives that are mandatory, measurable with a finite limit, and realistic should receive a classification value of MUST. Others that may be desirable should receive a classification value of WANT. Not all CLASSIFICATION cells need be entered; a default value of WANT is then assigned. Additional objectives may also be added at this screen by clicking INSERT OBJECTIVES button 308. In this manner the objectives sought by the decision are ranked into groups representing objectives such as uncompromisable and optional.

Next, the user advances to WEIGHT THE WANTS screen (Fig.23) to further classify the optional WANT objectives. Below the DECISION STATEMENT cell, each OBJECTIVE cell 304 is displayed adjacent a WEIGHT cell 314. NOTES cell 306, corresponding to each objective, is also displayed, and may be further modified with descriptive text. Each OBJECTIVES cell 304 is further subdivided into a descriptive portion 316 and a relative weight portion 318. The relative weight portion may be implemented as a slide bar 320. For each WANT objective, the user determines a relative priority

weight. The most compelling objective is assigned a value of ten on a zero to ten scale, however the upper limit could be varied to suit the granularity desired as can the scale itself. The user then considers each remaining objective and assigns a relative weight accordingly.

Following the WEIGHT THE WANTS screen, the user progresses to the generate alternatives screen shown in Fig. 24. This screen is for generating alternatives based on the previously entered objectives. MUST and WANT objectives are displayed in MUST OBJECTIVES cell 322 and WANT OBJECTIVES cell 324. Want objectives may be sorted by relative weight cell 318 value, or may remain in the order entered. The user scrolls through the MUST and WANT objectives to generate alternatives, and enters these alternatives in ALTERNATIVE cell 326. The user may scroll through the objectives in any order. However, considering the MUST objectives first ensures that mandatory items are reflected in the resulting alternatives list. Additionally, users may query the knowledge base for previously entered alternatives using query engine, described further below. Additional alternatives may be entered by clicking INSERT ALTERNATIVES button 328. Objectives may also be added by clicking insert MUST OBJECTIVE button 330 and insert WANT OBJECTIVE button 332. Once all alternatives are entered, the user advances to the screen alternatives through the musts screen, shown in Fig. 25, to refine and narrow the entered alternatives.

On screen alternatives through the MUSTS screen (Fig. 25), the MUST OBJECTIVES 322 and the ALTERNATIVES 326 are displayed in a matrix form for review and selection. Scroll bars 336 and 334 can be used for horizontal scrolling through the alternatives and vertical scrolling through the must objectives, respectively. A FEASIBILITY cell 338 is therefore provided corresponding to each alternative and must objective. Descriptive text to describe how an alternative does or does not meet a must

objective is entered by the user in descriptive portion 340. Each FEASIBILITY cell 338 also has a GO/NO GO toggle button 342 to provide a discrete indication of whether an alternative satisfies a particular must objective. An alternative with even one "no go" attributed to it is deemed eliminated and is not carried forward. However, it will be retained in the knowledge base for later query and retrieval.

Following consideration of MUST objectives, the COMPARE ALTERNATIVES AGAINST THE WANTS screen (Fig. 26) is entered. This screen is provides a WANT ALTERNATIVE slider 344 to rank alternatives, such as on a 1-10 scale, rather than a discrete GO/NO GO toggle. Previously entered want weight 318 is also displayed for reference. For each want objective/alternative combination, a FEASIBILITY cell 340 is provided to describe the alternative with respect to the objective. Each WANT OBJECTIVE 304 is compared to ALTERNATIVES 326. The alternative which best satisfies the want objective receives a score 346 value of ten, or highest, using slider 344. The other alternatives for that WANT OBJECTIVE 324 are scored relative to the alternative which received the score of ten.

Once the ALTERNATIVES 326 are scored, a weighted score for each objective 324 is computed and displayed. The weighted score is the result of the weight value assigned the objective multiplied by the score value assigned to this alternative. The total weighted scores then indicate which alternatives best satisfy the objectives. Also provided is a total alternative score 348 for each alternative, which serves as an indicator of the alternatives having a greater overall impact. A tentative choice button 350 is clicked to indicate which alternatives are selected by the user, which need not be the alternatives having the highest total alternative score 348.

Following the scoring of the alternatives, risks associated with each alternative selected for further evaluation are considered on the identify adverse consequences screen (Fig. 27). The remaining alternatives are displayed in descending order by total alternative score, one at a time in alternatives cell 326, along with the corresponding total alternative score cell 348. Users scroll through the alternatives carried over from the previous screen using alternative selection buttons 352. As each alternative is displayed, users identify a possible adverse consequence 353 which could result from this alternative. The user enters descriptive text in "if" cell 354 to define the condition under which the adverse consequence could occur. Probability cell 356 is a pull-down of choices such as low, medium, and high, indicative of the probability that the adverse consequence will occur. "Then" cell 358 is for descriptive text concerning the result of the adverse consequence occurring, and seriousness cell 360 is a pull-down with the options low, medium, and high indicative of the magnitude of the result should the adverse consequence occur. Notes cell 362 is for descriptive text concerning other information about the condition or result for further clarification or later query. Multiple consequences for an alternative may be entered through INSERT adverse CONSEQUENCE button 364.

Fig. 28 shows the MAKE THE BEST BALANCED CHOICE screen. This screen is used to select one alternative as a decision by displaying cells for the ADVERSE CONSEQUENCES 353 carried over from the previous screen, the total alternative score cell 348, and the want OBJECTIVES cell 324, entered previously. Mandatory "MUST" objectives have already been considered by eliminating the alternatives which do not satisfy them. Accordingly, the adverse consequence cells 353, WANT OBJECTIVE cells 324, and ALTERNATIVES cells 326, may now be scrolled through to evaluate the elements of each available alternative 326.

Additional want objectives or adverse consequences may also be entered on this screen by clicking on INSERT WANT OBJECTIVE button 366 or INSERT ADVERSE CONSEQUENCE button 368, respectively. The chosen alternative is marked as a final decision by DECISION checkbox cell 370.

Following selection of final decision, the IMPLEMENT DECISION screen is displayed (Fig. 29). This screen displays the final decision 372 as chosen on the previous screen from the most appealing alternative 326, and further provides ACTION TRACKER cells for ACTION 376, WHO 378, WHEN 380, and NOTES 382. These cells provide input to the ACTION TRACKER, and are used similarly to the action tracker cells in the other screen sequences. Actions required to implement or complete the chosen decision are assigned to groups or individuals, scheduled, and tracked using the action tracker, described further below.

POTENTIAL PROBLEM ANALYSIS

Once a decision is made, the implementation of that decision may nonetheless encounter problems. The potential problem analysis screen sequence is used to enter and organize events and/or occurrences which may hinder the implementation of action plans. This screen sequence may be pursued following entry of ACTION TRACKER cells after a decision analysis or other process screen sequence, above, or may be undertaken alone with respect to an independent course of action.

Referring to Fig. 30, the DEVELOP A PLAN screen is shown. An action statement defining a specific and concise purpose of the action, task, or project is entered in ACTION STATEMENT cell 400. This statement may be carried over or modified from a decision analysis, or may be entered as free form text. A set of ACTION cells 402 is provided, which may be populated from an action tracker file or entered by the user. ACTION PLAN cell 404, NOTES cell 406, WHO cell 408, and WHEN cell 410 are used as in

other process screen sequences to enter actions or tasks, clarifying notes, responsible groups or individuals, and due dates, respectively, and are described with the action tracker description below. Additional ACTION cells may be entered by clicking on INSERT ACTION button 412.

List potential problems screen (Fig. 31) is then used to view each ACTION cell 403 individually, and enter potential problems which could be raised by the specific action in POTENTIAL PROBLEMS cell 416. The POTENTIAL PROBLEMS cell allows entry of a concise statement to respond to important areas of the corresponding action. This sequence therefore allows entry of specific, concise potential problems corresponding to a particular action for later analysis. Scroll buttons 414 are used to advance through the ACTION cells 402 to review each action.

After the user has entered the potential problems for the actions, the ASSESS THREATS screen (Fig. 32) is used to identify potential problems which require the most attention, and those which are unlikely to have a serious impact. The potential problems list entered on the previous screen therefore prioritizes the list to identify potential problems requiring attention first. ACTION STATEMENT cell 400 echoes the action statement. ACTION cell 403 lists the ACTION plan 404, NOTES 406, WHO 408, and when 410 cells individually, and may be scrolled using scroll buttons 414. For each ACTION cell 403, the potential problems associated with that action are listed in POTENTIAL PROBLEM cells 416. For a potential problem, the user enters a PROBABILITY cell 418, and a SERIOUSNESS cell 420. PRIORITY cell 422 is computed based on the values of the seriousness and probability cells after potential problems have been assigned values. PROBABILITY cell 418 is a pull-down with comparative values such as low, medium, and high. For each potential problem the user evaluates the probability of occurrence and enters a value accordingly. Similarly, SERIOUSNESS cell 420 is a low,

medium, high pull-down which is set according to the magnitude of the result should the potential problem occur. In this manner, the user can identify potential problems which represent an acceptable amount of risk, and those that need to be accounted for. INSERT PROBLEM button 424 can be used to add additional potential problems.

The CONSIDER LIKELY CAUSES screen (Fig. 33) is next used to enter likely causes of each of the potential problems. Each potential problem is displayed in POTENTIAL PROBLEM cell 426, along with the corresponding PRIORITY cell 422. In this manner, the user can elect to only address potential problems having a certain priority, high or medium, for example, and deem the others to represent an acceptable risk. For each potential problem chosen to be addressed, a LIKELY CAUSE cell 428 is provided for entering a concise statement of the actions, occurrences, or other events which might result in the potential problem. Multiple likely causes may be entered for each potential problem. A CAUSE PROBABILITY cell 430 is also provided to describe the probability of the cause occurring. CAUSE PROBABILITY pull-down 432 is used to enter a comparative discrete low, medium, or high value, while PROBABILITY notes portion 434 is used for descriptive text describing the probability. Additional likely causes attributed to a potential problem may be added through INSERT LIKELY CAUSE button 436.

The TAKING PREVENTIVE ACTION screen shown in Fig.34 is then used to enter one or more PREVENTIVE ACTION cells 438 corresponding to a particular likely cause. A preventative action to serve as a barrier against the likely cause is entered in this cell 438. CAUSE PROBABILITY cell 430 from the previous screen may be used to assess more serious likely causes first, or to accept the risk of a low probability likely cause.

Despite robust preventative actions, it is may be that the chance of a likely cause occurring cannot be reduced to

zero. TAKING CONTINGENT ACTION screen (Fig. 35) is used to enter actions which can minimize the effect if a particular potential problem nonetheless occurs. CONTINGENT ACTION cells 439 are used to enter such actions. Since such actions are only necessary if the potential problem occurs, TRIGGER cell 440 is used to specify the system, person, or event to invoke the particular contingent action. The information in TRIGGER cell 440 therefore contains information identifying the event that triggers and commences the contingent action to provide a rapid response to a particular potential problem. Additional CONTINGENT ACTION cells 439 and TRIGGER cells 440 may be added through the respective buttons 442, 444.

MODIFY PLAN screen (Fig. 36) is then used to review the action cells along with the preventative and contingent actions entered in this screen sequence. Upon finalization of the action plan, update ACTION TRACKER button 446 is used to store the information in the knowledge base where it is available to other process screen sequences as described further below with respect to the action tracker.

POTENTIAL OPPORTUNITY ANALYSIS

Once a decision is made, the implementation of that decision may provide additional opportunities. The potential opportunity analysis screen sequence is used to enter and organize events and/or occurrences which may offer opportunities in the implementation of action plans. This screen sequence may be pursued following entry of ACTION TRACKER cells following a decision analysis or other process screen sequence, above, or may be undertaken alone with respect to an independent course of action.

Referring to Fig. 49, the DEVELOP A PLAN screen is shown. An action statement defining a specific and concise purpose of the action, task, or project is entered in ACTION STATEMENT cell 900. This statement may be carried over or modified from a decision analysis, or may be

entered as free form text. A set of ACTION cells 902 is provided, which may be populated from an action tracker file or entered by the user. ACTION PLAN cell 904, NOTES cell 906, WHO cell 908, and WHEN cell 910 are used as in other process screen sequences to enter actions or tasks, clarifying notes, responsible groups or individuals, and due dates, respectively, and are described with the action tracker description below. Additional ACTION cells may be entered by clicking on INSERT ACTION button 912.

List potential opportunities screen (Fig. 50) is then used to view each ACTION cell 903 individually, and enter potential opportunities which could be raised by the specific action in POTENTIAL OPPORTUNITIES cell 916. The POTENTIAL OPPORTUNITIES cell allows entry of a concise statement to respond to important areas of the corresponding action. This sequence therefore allows entry of specific, concise potential opportunities corresponding to a particular action for later analysis. Scroll buttons 914 are used to advance through the ACTION cells 902 to review each action.

After the user has entered the potential opportunities for the actions, the ASSESS BENEFITS screen (Fig. 51) is used to identify potential opportunities which offer the greatest benefit, and those which are unlikely to have an opportunistic impact. The potential opportunities list entered on the previous screen therefore prioritizes the list to identify potential opportunities requiring attention first. ACTION STATEMENT cell 900 echoes the action statement. ACTION cell 903 lists the ACTION plan 904, NOTES 906, WHO 908, and when 910 cells individually, and may be scrolled using scroll buttons 914. For each ACTION cell 903, the potential opportunities associated with that action are listed in POTENTIAL OPPORTUNITY cells 916. For each potential opportunity, the user enters a PROBABILITY cell 918, and a SERIOUSNESS cell 920. PRIORITY cell 922 is computed based on the values of the benefit and

probability cells after potential opportunities have been assigned values. PROBABILITY cell 918 is a pull-down with comparative values such as low, medium, and high. For each potential problem the user evaluates the probability of occurrence and enters a value accordingly. Similarly, BENEFIT cell 920 is a low, medium, high pull-down which is set according to the magnitude of the result should the potential opportunity occur. In this manner, the user can identify potential opportunities which represent an acceptable amount of benefit, and those that need to be acted upon. INSERT OPPORTUNITY button 924 can be used to add additional potential opportunities.

The CONSIDER LIKELY CAUSES screen (Fig. 52) is next used to enter likely causes of each of the potential opportunities. Each potential opportunity is displayed in POTENTIAL OPPORTUNITY cell 926, along with the corresponding PRIORITY cell 922. In this manner, the user can elect to only address potential opportunities having a certain priority, high or medium, for example, and deem the others to represent a lower priority benefit. For each potential opportunity chosen to be addressed, a LIKELY CAUSE cell 928 is provided for entering a concise statement of the actions, occurrences, or other events which might result in the potential opportunity. Multiple likely causes may be entered for each potential problem opportunity. A CAUSE PROBABILITY cell 930 is also provided to describe the probability of the cause occurring. CAUSE PROBABILITY pull-down 932 is used to enter a discrete comparative value such as low, medium, or high, while PROBABILITY notes portion 934 is used for descriptive text describing the probability. Additional likely causes attributed to a potential problem may be added through INSERT LIKELY CAUSE button 936.

The TAKING PROMOTING ACTION screen shown in Fig. 53 is then used to enter one or more PROMOTING ACTION cells 938 corresponding to a particular likely cause. A promoting

action to serve as a barrier against the likely cause is entered in this cell 938. CAUSE PROBABILITY cell 930 from the previous screen may be used to assess higher benefit likely causes first, or to no longer consider a low probability likely cause.

Despite robust promoting actions, it is unlikely that the chance of a likely cause occurring can be increased to be a certainty. TAKING CAPITALIZING ACTION screen (Fig. 54) is used to enter actions which can maximize the effect if a particular potential opportunity occurs, whether caused by the promoting action or not. CAPITALIZING ACTION cells 939 are used to enter such actions. Since such actions are only necessary if the potential opportunity occurs, TRIGGER cell 940 is used to specify the system, person, or event to invoke the particular capitalizing action. The information in TRIGGER cell 940 therefore provides an enumeration to provide a rapid response to a particular potential opportunity. Additional CAPITALIZING ACTION cells 939 and TRIGGER cells 940 may be added through the respective buttons 942, 944.

When the capitalizing actions and triggers have been identified, it is often necessary to take preparatory actions that set the capitalizing actions and/or triggers in place before the potential opportunity might occur, and to remove the capitalizing actions and triggers after the potential opportunity could no longer occur.

MODIFY PLAN screen (Fig. 55) is then used to review the action cells along with the promoting and capitalizing actions entered in this screen sequence. Upon finalization of the action plan, update ACTION TRACKER button 946 is used to store the information in the knowledge base where it is available to other process screen sequences as described further below with respect to the action tracker.

ACTION TRACKER

The action tracker interface is used to store, identify and compare tasks, responsible individuals or groups, due dates, and other logistical information associated with the various process screen sequence defined herein. The action tracker can be updated directly, or through action tracker data entered during the process screen sequences. Referring to Fig. 37, the ACTION TRACKER master screen is shown. This screen is similar to the ACTION TRACKER entry screen in the other process screen sequences. ACTION FILE cell 500 is used to select a previously entered action file for review and/or update. Action files on users systems across the network are listed here for various action files resulting from the process screen sequences described above. In this manner, enterprisewide monitoring of the various process screen sequences being undertaken is provided. REFRESH button 503 can be used to update the action tracker master screen with any new information entered by a user concerning a process screen sequence.

CONCERN cells 502 in the ACTION FILE 504, that can also be implemented in the other processes, list the concerns stored in the ACTION FILE 504 selected. Each concern is evaluated by criteria such as: urgency, growth, and seriousness, and is specified along a scale through a pull-down menu. A fourth cell, PRIORITY, is computed based on the values of the other three. SERIOUSNESS cell 506 is for entering a discrete ranking of magnitude relative to the seriousness of other concerns, and has a value of High (H), medium (M), low (L), and need more data (NMD). URGENCY cell 508 is rated based on a determination of when resolution of this concern would become difficult, expensive, or impossible, and has a value of low, medium, or high. GROWTH cell 510 is for indicating the potential that the seriousness of the concern will grow. PROCESS cell 512 is for specifying which of the process screen

sequences applies to this concern: situation appraisal, problem analysis, decision analysis, or potential problem analysis. CONCERN SORT pull-down 514 allows the CONCERNS 502 from the action file to be sorted by various fields such as concern, process, or priority. VIEW BY pull-down 527 allows a user to view all concerns in the action file, or only those specific to a certain individual, such as all concerns to which the user is attributed an action.

Clicking on a CONCERN cell 502 displays all actions currently entered for that concern in the ACTION cells 516, for review and/or modification. Additional actions may be added to those uploaded from the action file. WHO cell 518 specifies the group or individuals responsible for executing the task specified in the action cell, and may be modified through a pull-down list of names and groups. Multiple names may be entered, and new names not in the pull-down may be added. WHEN cell 520 indicates the expected completion date of the action. STATUS cell 524 provides a discrete indication of milestones reached concerning the action, such as not started, in progress, late, action assigned, cancelled, on hold, cause confirmed. Additional status milestones may be added. NOTES cell 522 contains descriptive text concerning other information. ACTION SORT pull-down 526 allows the listed actions to be sorted by various fields such as ACTION, WHO, WHEN, NOTES, or STATUS. Actions may automatically be mailed electronically to others, including to recipients who are not users of the system. Alternative screen formats for the various GUI screens disclosed herein are listed in Figs. 56-137.

KNOWLEDGE BASE STRUCTURE

An entity-relationship (ER) diagram of the knowledge base accumulated through the various process screen sequences as defined herein is shown in Figs. 38-42. In addition, the knowledge base links process applications and

tracks changes made on a user-by-user basis.

Situation appraisal ER diagram is shown in Fig. 38, and contains cells for storing the information entered in the cells during the situation appraisal process screen sequence. CONCERN 600, PRIORITY 602, and the PROCESS 604 to be used for further analysis are stored in refined CONCERN entity 606. ACTION TRACKER cells WHO 608, ACTION 610, and WHEN 612 are stored in INVOLVEMENT entity 614.

Fig. 39 shows the problem analysis ER diagram, and contains cells pertinent to the problem analysis process screen sequence. SHOULD BE HAPPENING 616, ACTUALLY HAPPENING 618, OBJECT 620, and DEVIATION 622 are stored in PROBLEM entity 624. IS/IS not cells are stored in RESPONSE entity 626. DISTINCTIONS 628 are stored in DISTINCTIONS entity 630. CHANGES 632 are stored in CHANGES entity 634. POSSIBLE CAUSES 636 are stored in PROBABLE CAUSES entity 638. CONDITIONS AND ASSUMPTIONS 640 are stored in TEST RESPONSES entity 642. CONFIRMED TRUE CAUSE 644 is stored in BEYOND FIX 646. ACTION TRACKER cells are stored in CAUSE ACTIONS entity 648.

Fig. 40 shows the decision analysis ER diagram. BACKGROUND 650 and STATEMENT 652 are stored in DECISION ENTITY 654. SCORES 656 for the various alternatives are stored in ALTERN 658.

Potential problem analysis ER diagram is shown in Fig. 41. POTENTIAL PROBLEM 660, SERIOUSNESS 664, and PROBABILITY 662 are stored in SPECIFICATION entity 666. LIKELY CAUSES 668 are stored in CAUSE entity 670. PREVENTATIVE ACTIONS 672 are stored in PREVENT ACTION entity 674. CONTINGENT ACTIONS 676 are stored in CONTINGENCY ACTION 678 entity, and corresponding TRIGGERS 680 are stored in TRIGGER entity 682.

Potential opportunity analysis ER diagram is shown in Fig. 41a, and is similar in structure to the potential problem analysis ER diagram shown in Fig. 41. Potential opportunity 660a, benefit 664a, and probability 662a are

stored in SPECIFICATION entity 666a. Likely causes 668a are stored in CAUSE entity 670a. PROMOTING ACTIONS 672a are stored in PROMOTE ACTION entity 674a. Capitalizing actions 676a are stored in CAPITALIZING ACTION 678a entity, and corresponding triggers 680a are stored in TRIGGER entity 682a.

Fig. 42 shows the action tracker ER diagram. CONCERNS 684, SERIOUSNESS 686, URGENCY, 688, GROWTH 690, and PRIORITY 692 are stored in CONCERNS entity 694. ACTIONS 696, WHO 698, WHEN 700, NOTES 704, and STATUS 702 are stored in ITEMS entity 706.

The knowledge base as described above is populated with cells entered in the corresponding process screen sequences. This knowledge base may be queried during current process screen sequences to draw upon knowledge obtained from prior process screen sequences. Such queries and reports are through a standard SQL interface, and may be broad report-based statistical information, or specific keyword queries to pinpoint a specific process screen sequence. Such keyword queries are facilitated by the use of a master keyword table. Prior to saving any of the process screen sequences as defined herein, process records are parsed for occurrences of new keywords. New keywords not previously entered are displayed to the user, who is prompted to enter, categorize, and create associations for the keywords in the master keyword table.

These queries and reports may be predetermined, to address periodic status items such as displaying all unresolved problem analysis, or to list all decisions concerning a particular product line, or may be individual point-and-click queries using the individual knowledge base fields. An integrated database engine such as ORACLE® provides initial support for the knowledge base, however other database engines using SQL or other query language could be employed in alternative implementations or to customize an application to a particular user.

CLASS HIERARCHY

The class inheritance graphs of the complex situation assessment application as defined herein are shown in Figs. 43-48. Where applicable, connection links (A)-(N) are shown with the respective circled capital letters to indicate multiple sheet graphs.

The general process screen sequence class inheritance graph 800 is shown in Fig. 43. This graph defines the general process class common to the process screen sequences defined above. Situation appraisal inheritance graph is shown on Figs. 44a-44c. Situation class 802 is derived from the general process class, and manipulates situation background and general information. Concerns are manipulated by initial CONCERNS class 804 and REFINED CONCERNS class 806. Analysis needed is manipulated by SPECIFICATION class 808.

Referring to Figs. 45a-45d, the problem analysis inheritance graph is shown. PROBLEM ANALYSIS analysis class 810 is derived from the general PROCESS class 800 (Fig. 43). INITIATING DATA class 812 manipulates the problem object and the problem deviation. Test against SPECIFICATION class 814 manipulates is/is not information. POSSIBLE CAUSE class 816 manipulates possible causes. Changes and distinctions are handled by DISTINCTION/CHANGES pairs class 818.

Decision analysis process screen sequence class inheritance graph is shown in Fig. 46. DECISION ANALYSIS class 824 is derived from the general process class (800, Fig. 43). Objectives are manipulated by DECISION ANALYSIS OBJECTIVES class 818. Alternatives are handled by DECISION ANALYSIS ALTERNATIVES class 820. Adverse consequences are manipulated by DECISION ALTERNATIVES RISK class 822.

Fig. 47 shows the class inheritance graph for the potential problem analysis screen sequence. POTENTIAL PROBLEM ANALYSIS class 826 is derived from the general

PROCESS class 800, and also handles the action statement. Action description, probability, and seriousness are handled by POTENTIAL PROBLEM ANALYSIS SPECIFICATION class 828. Likely causes and preventative actions are handled by the LIKELY CAUSES AND PREVENTATIVE ACTION classes 830 and 832, respectively. Contingent actions and the associated triggers are handled by CONTINGENCY ACTION and ACTION TRIGGER classes 834 and 836, respectively.

Fig. 47a shows the class inheritance graph for the potential opportunity analysis screen sequence. POTENTIAL OPPORTUNITY ANALYSIS class 826a is derived from the general PROCESS class 800a, and also handles the action statement. Action description, probability, and benefit are handled by POTENTIAL OPPORTUNITY ANALYSIS SPECIFICATION class 828a. Likely causes and promoting actions are handled by the LIKELY CAUSES AND PROMOTING ACTION classes 830a and 832a, respectively. Capitalizing actions and the associated triggers are handled by CAPITALIZING ACTION and ACTION TRIGGER classes 834a and 836a, respectively.

Action tracker inheritance graph is shown on Fig. 48. ACTION TRACKER CONCERNS class 838 manipulates concerns and the related ranking cells of seriousness, urgency, growth, and priority as defined above. Action descriptions and associated logistic scheduling data is manipulated by ACTION TRACKER ITEMS class 840.

As various extensions and modifications to the present invention, including alternate embodiments of screen layout, sequence, and input methods may be apparent to those skilled in the art, the present invention is not intended to be limited except by the following claims.

CLAIMS

1. A method of gathering, processing, storing, and displaying information concerning a complex business situation comprising the steps of:

providing a graphical user interface for entering data concerning said complex business situation;

refining said data in a predetermined, stepwise manner through user interaction with said graphical user interface;

generating, through said stepwise manner and said graphical user interface, a list of effective actions for addressing said complex business situation; and

storing said data in an indexed and normalized form in a knowledge base adapted for structured query and retrieval in performing said steps of refining and generating.

2. A computer program product comprising computer readable program code fixed on a computer readable medium operable to receive, process, store, and display information concerning a complex business situation comprising:

computer readable program code for providing a graphical user interface for entering data concerning said complex business situation;

computer readable program code for refining said data in a predetermined, stepwise manner through user interaction with said graphical user interface;

computer readable program code for generating a list of effective actions for addressing said complex business situation through use of said computer readable program code for refining said data; and

computer readable program code for storing said data in an indexed and normalized form in a knowledge base adapted for structured query and retrieval by said

computer readable program code for refining said data and said computer readable program code for generating said list.

3. An apparatus for gathering, processing, storing, and displaying information concerning a complex business situation comprising:

a graphical display device operable to provide a graphical user interface for entering data concerning said complex business situation;

a digital input device for entering said data;

a first memory for storing said data for indexed retrieval;

a processor for refining said data stored in said first memory in a predetermined, stepwise manner through user interaction with said graphical user interface and said digital input device;

a second memory having a set of instructions operable by said processor to generate, through said stepwise manner and said graphical user interface, a list of effective actions for addressing said complex business situation; and

a third memory operable to store said entered data and said refined data in an indexed and normalized form in a knowledge base adapted for structured query and retrieval.

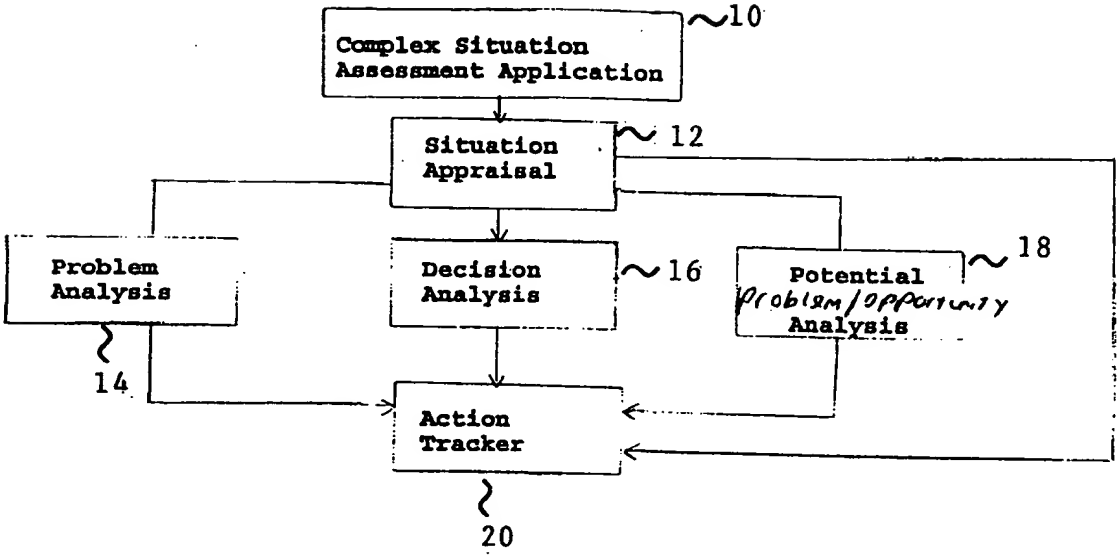

Complex Situation Assessment Application
10
Situation Appraisal
12
Problem Analysis
14
Decision Analysis
16
Potential Problem/Opportunity Analysis
18
Action Tracker
20

Fig. 1

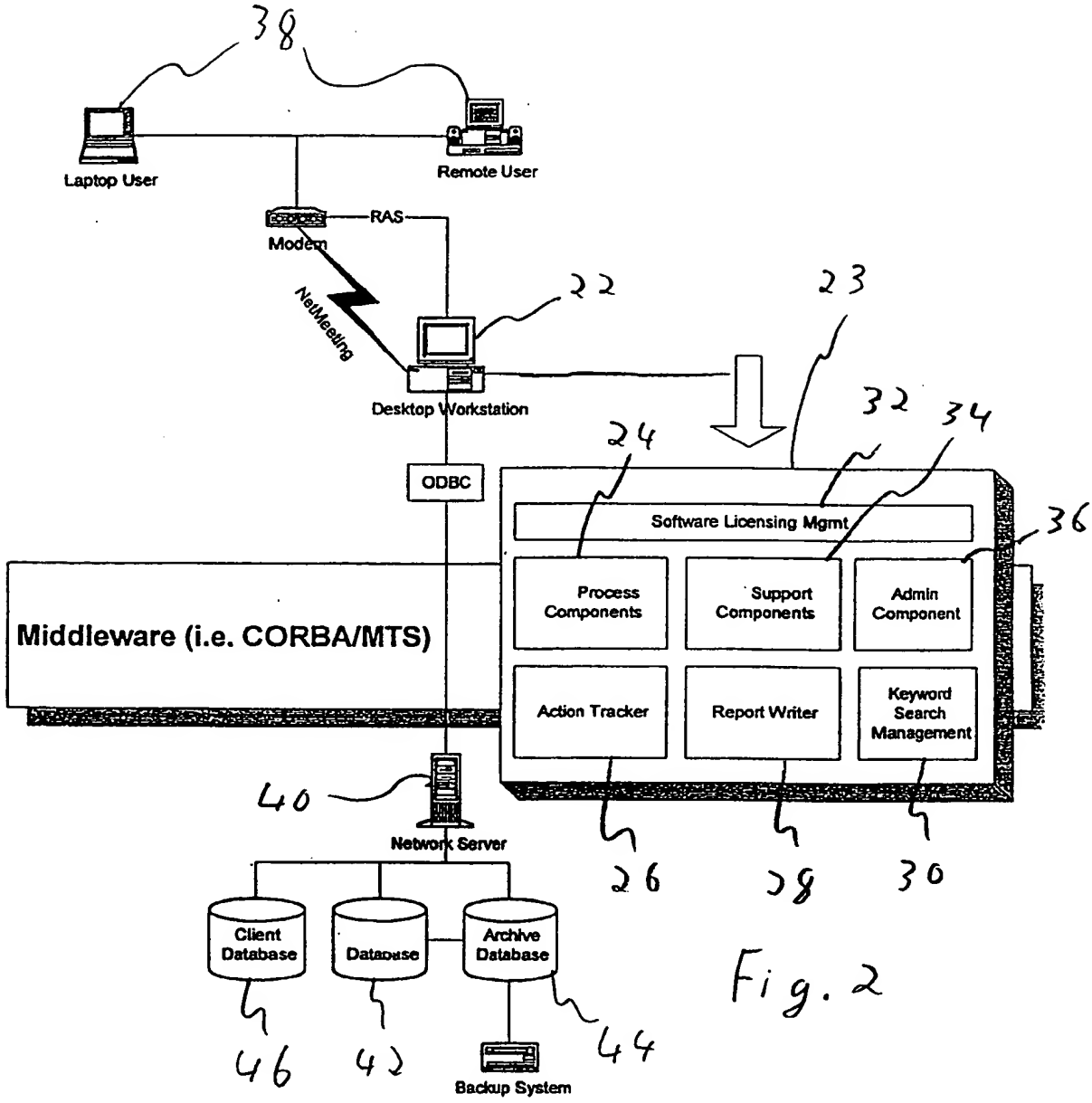

38
Laptop User
Remote User
RAS
Modem
NetMeeting
22
23
Desktop Workstation
32
34
24
ODBC
Software Licensing Mgmt
36
Middleware (i.e. CORBA/MTS)
Process Components
Support Components
Admin Component
Action Tracker
Report Writer
Keyword Search Management
40
Network Server
26
28
30
Client Database
Database
Archive Database
46
42
44
Backup System

Fig. 2

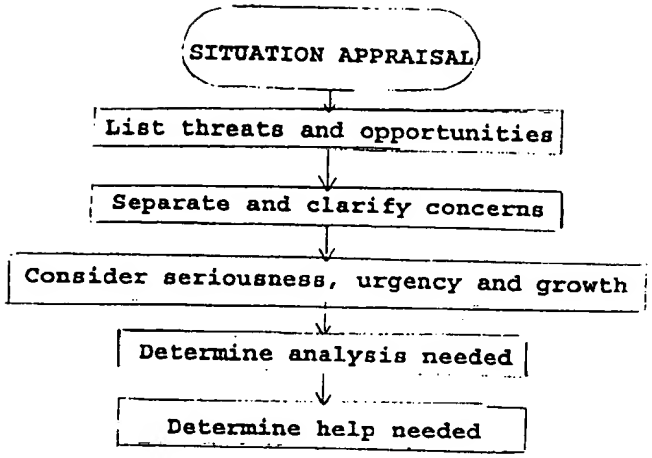

SITUATION APPRAISAL
List threats and opportunities
Separate and clarify concerns
Consider seriousness, urgency and growth
Determine analysis needed
Determine help needed
50

Fig. 3

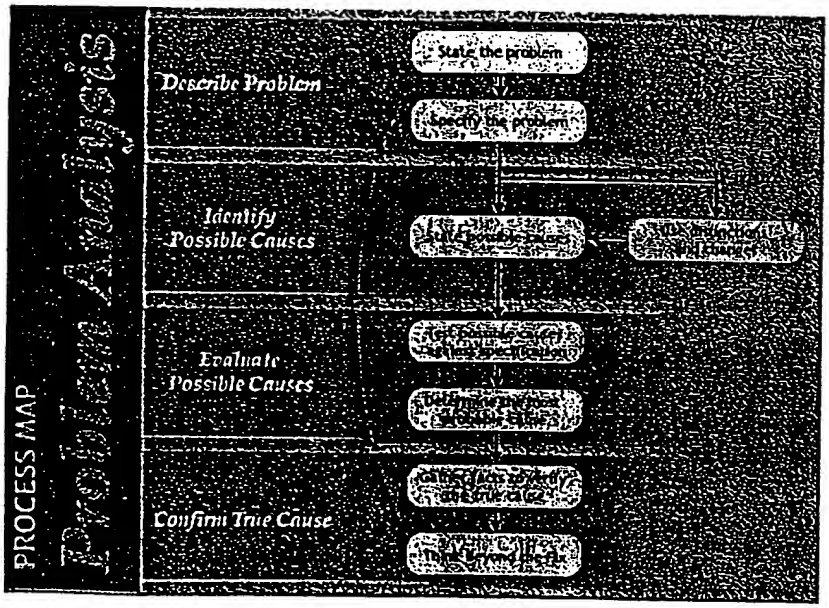

PROCESS MAP
Problem Analysis
Describe Problem
State the problem
Identify Possible Causes
Evaluate Possible Causes
Confirm True Cause
52

Fig. 4

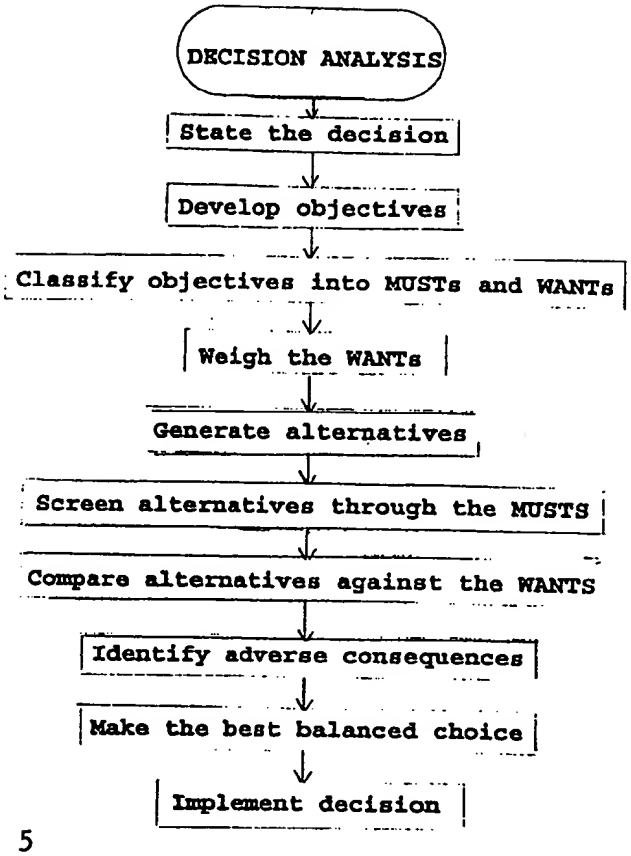

DECISION ANALYSIS
State the decision
Develop objectives
Classify objectives into MUSTs and WANTs
Weigh the WANTs
Generate alternatives
Screen alternatives through the MUSTS
Compare alternatives against the WANTS
Identify adverse consequences
Make the best balanced choice
Implement decision
54

Fig. 5

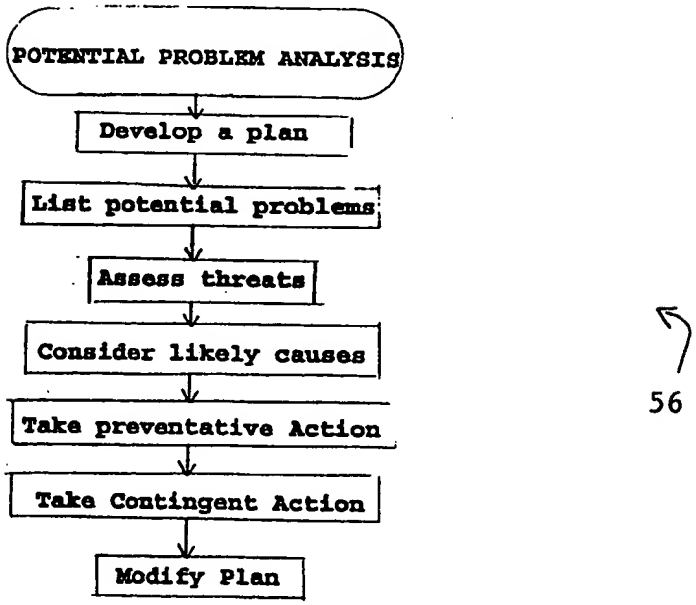

POTENTIAL PROBLEM ANALYSIS
Develop a plan
List potential problems
Assess threats
Consider likely causes
Take preventative Action
Take Contingent Action
Modify Plan
56

Fig. 6

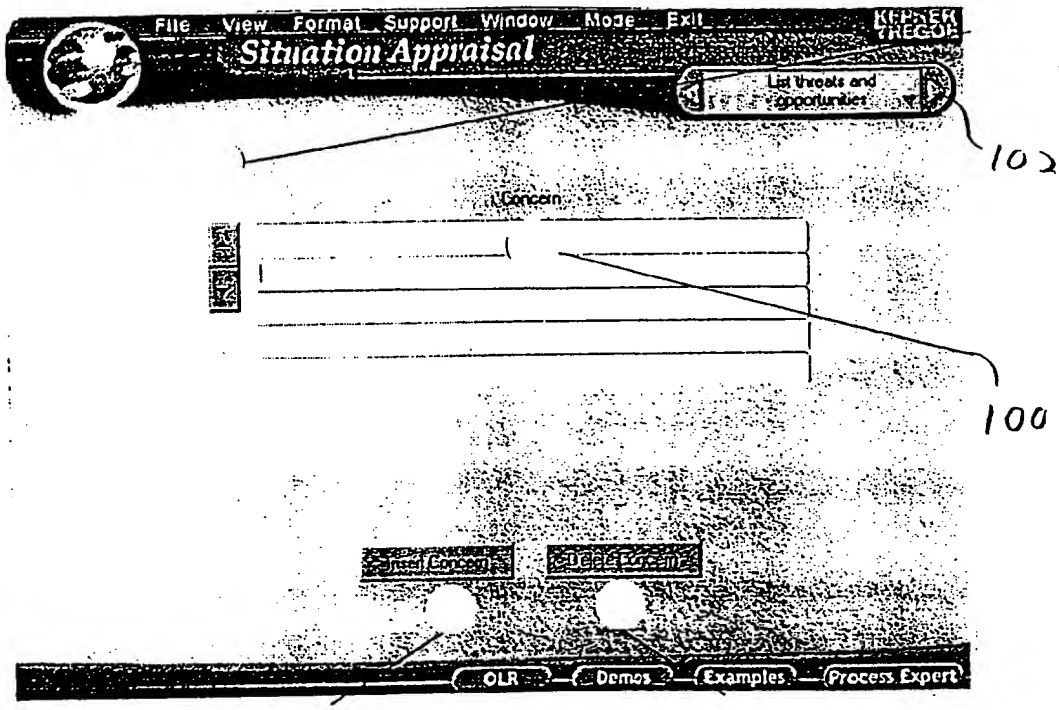

File View Format Support Window Mode Exit
Situation Appraisal
List threats and opportunities
102
Concern
100
OLR
Demos
Examples
Process Expert

Fig. 7

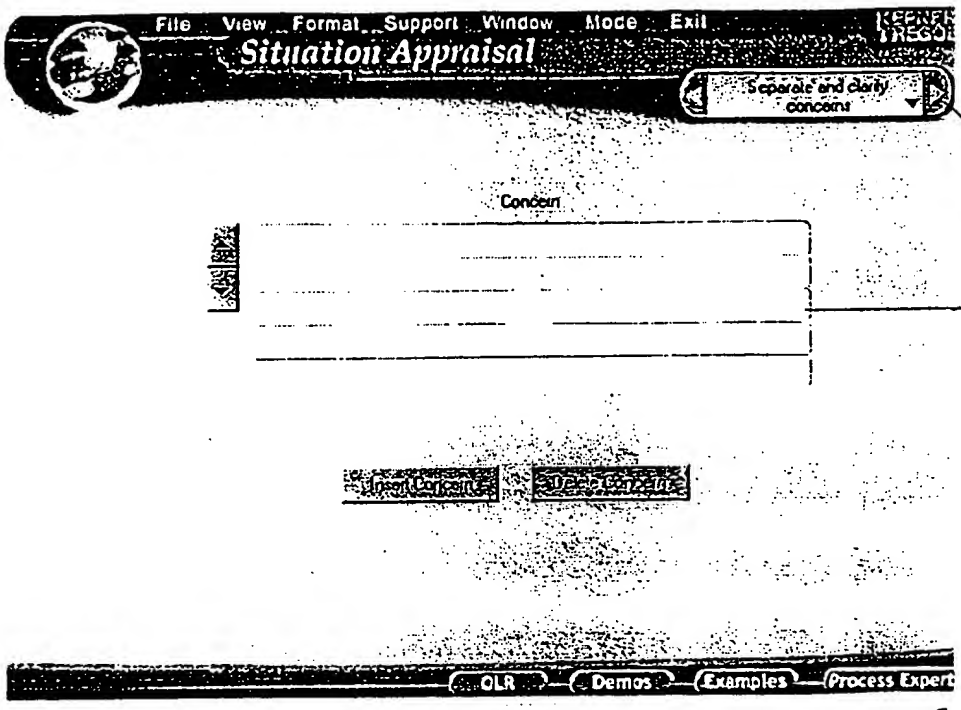

File View Format Support Window Mode Exit
Situation Appraisal
Separate and clarify concerns
Concern
OLR
Demos
Examples
Process Expert
102
104

Fig 8

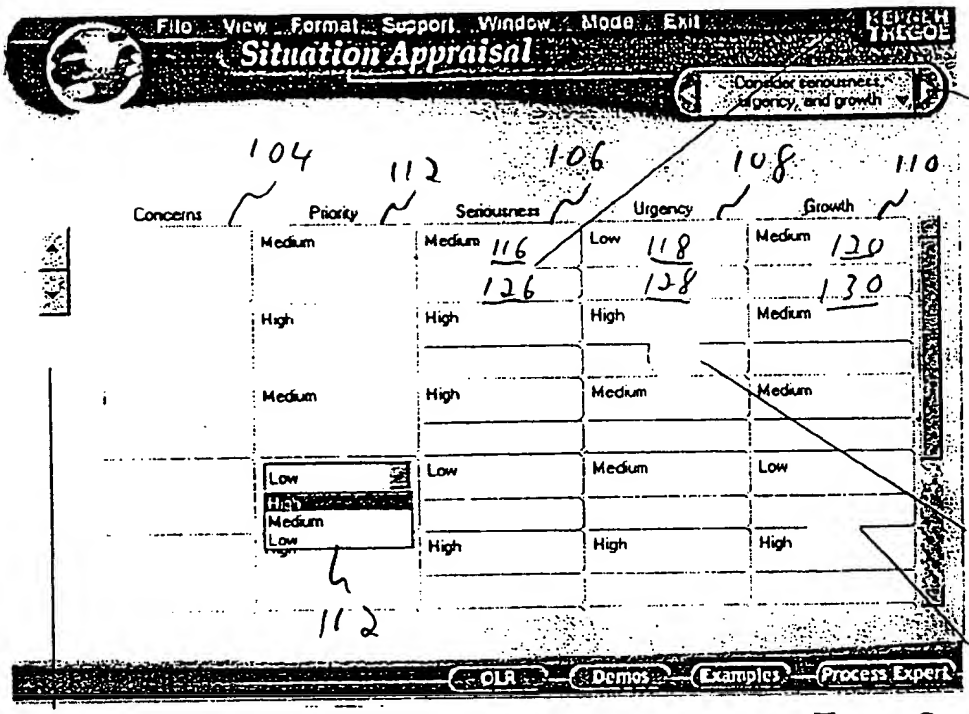

File View Format Support Window Mode Exit
Situation Appraisal
Consider seriousness, urgency, and growth
104
112
106
108
110
102
Concerns
Priority
Seriousness
Urgency
Growth
Medium
Medium
116
Low
118
Medium
120
126
128
130
High
High
High
Medium
Medium
High
Medium
Medium
Low
Low
Medium
Low
High
High
High
High
Medium
Low
112
OLR
Demos
Examples
Process Expert

Fig. 9

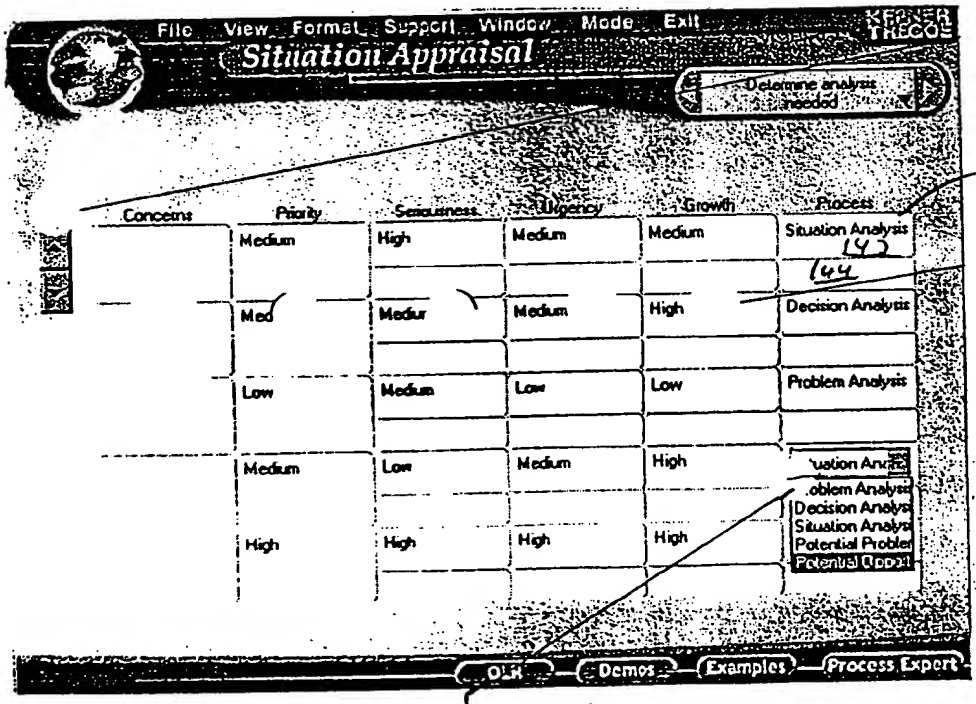

File View Format Support Window Mode Exit
Situation Appraisal
Determine analysis needed
140
Concerns
Priority
Seriousness
Urgency
Growth
Process
Medium
High
Medium
Medium
Situation Analysis
142
144
Med
Medium
Medium
High
Decision Analysis
Low
Medium
Low
Low
Problem Analysis
Medium
Low
Medium
High
High
High
High
High
Decision Analysis
Situation Analysis
Potential Proble
Potential Oppor
OLR
Demos
Examples
Process Expert
146

Fig. 10

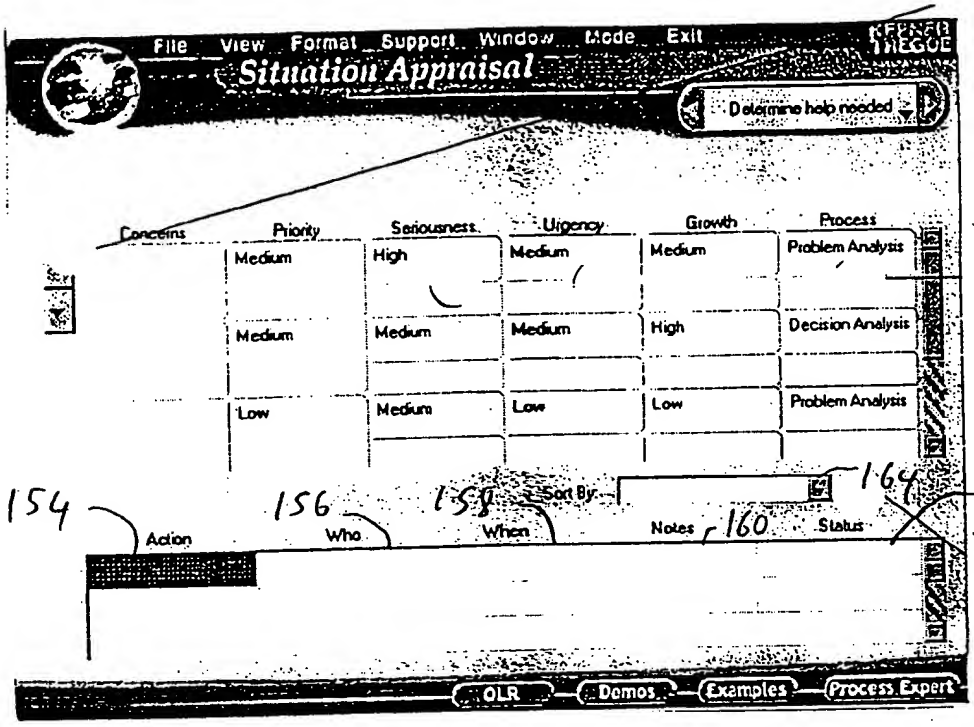

File View Format Support Window Mode Exit
Situation Appraisal
Determine help needed
Concerns
Priority
Seriousness
Urgency
Growth
Process
Medium
High
Medium
Medium
Problem Analysis
Medium
Medium
Medium
High
Decision Analysis
Low
Medium
Low
Low
Problem Analysis
150
154
156
158
Sort By:
164
162
Action
Who
When
Notes
160
Status
152
OLR
Demos
Examples
Process Expert

Fig. 11

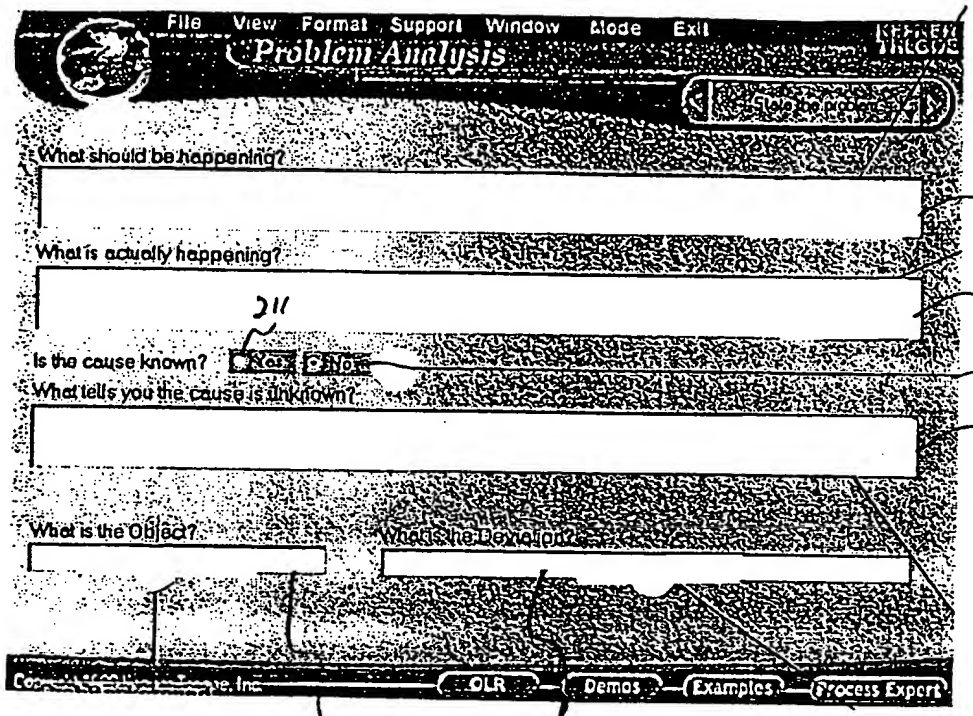

File View Format Support Window Mode Exit
Problem Analysis
What should be happening?
What is actually happening?
Is the cause known?
What tells you the cause is unknown?
What is the Object?
OLR
Demos
Examples
Process Expert
200
201
210
204
211
206
208

Fig. 12

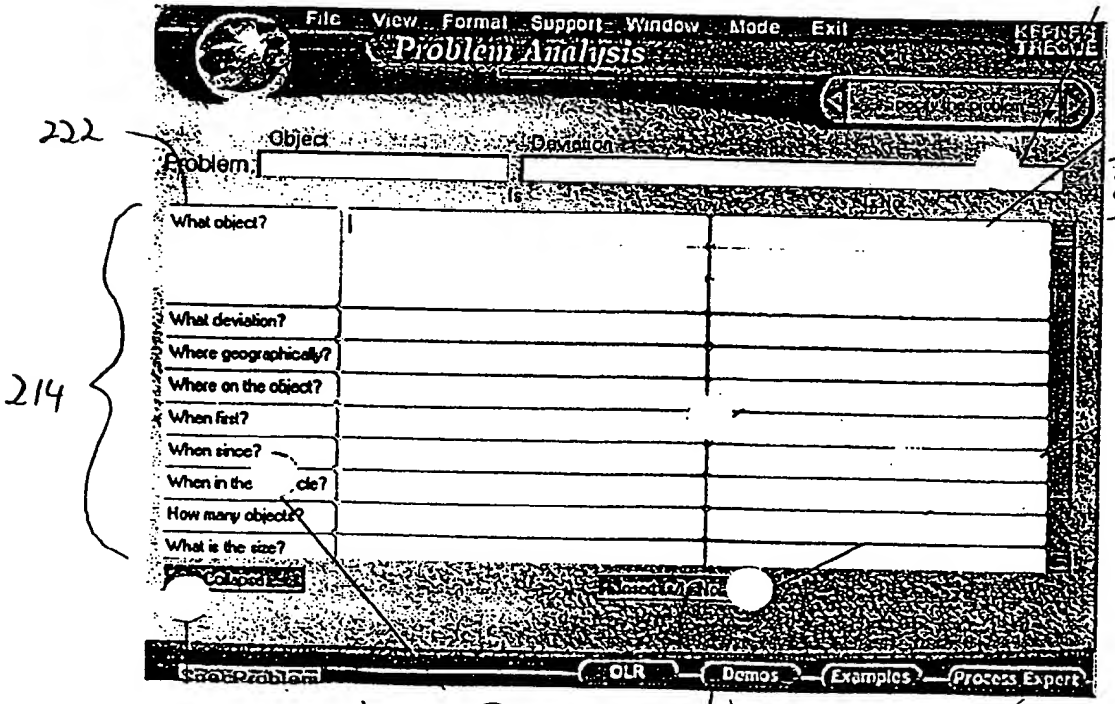

File View Format Support Window Mode Exit
Problem Analysis
Object
Problem
Deviation
What object?
What deviation?
Where geographically?
Where on the object?
When first?
When since?
When in the cle?
How many objects?
What is the size?
OLR
Demos
Examples
Process Expert
222
212
214
216
220
218

Fig. 13

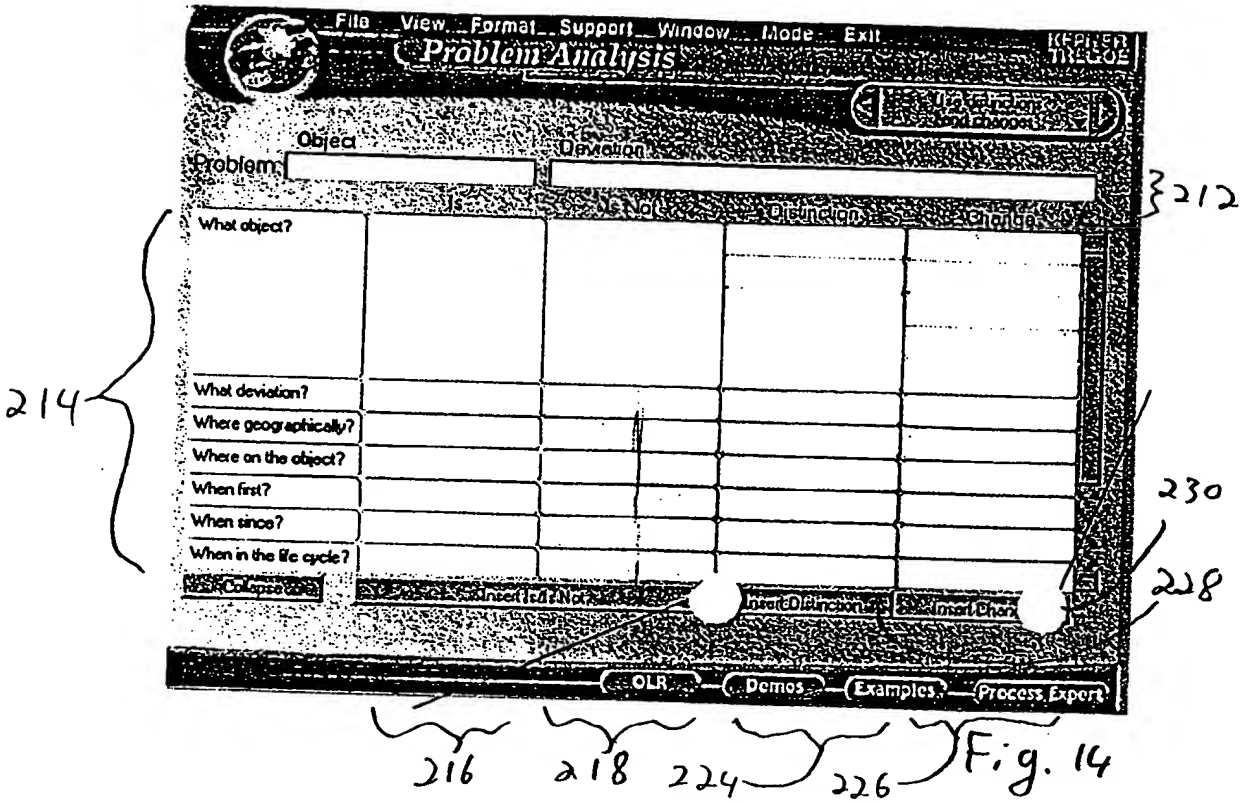

File View Format Support Window Mode Exit
Problem Analysis
Problem:
What object?
What deviation?
Where geographically?
Where on the object?
When first?
When since?
When in the life cycle?
OLR
Demos
Examples
Process Expert
212
214
216
218
224
226
228
230

Fig. 14

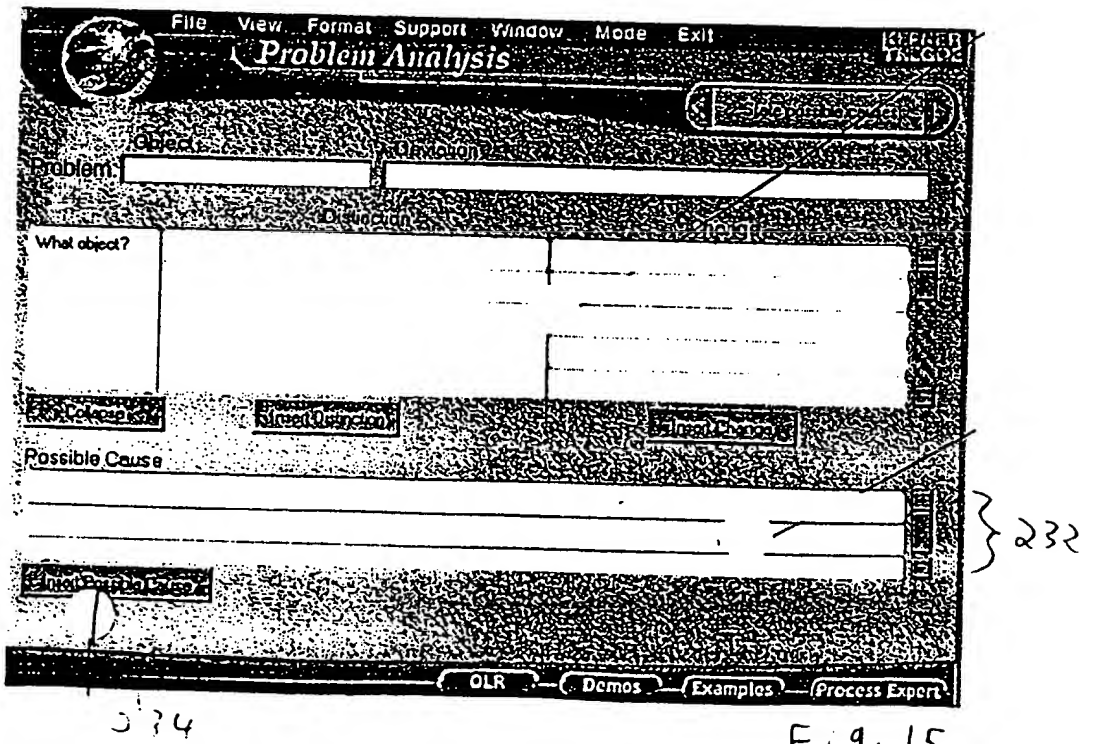

File View Format Support Window Mode Exit
Problem Analysis
Problem:
What object?
Possible Cause
OLR
Demos
Examples
Process Expert
232
234

Fig. 15

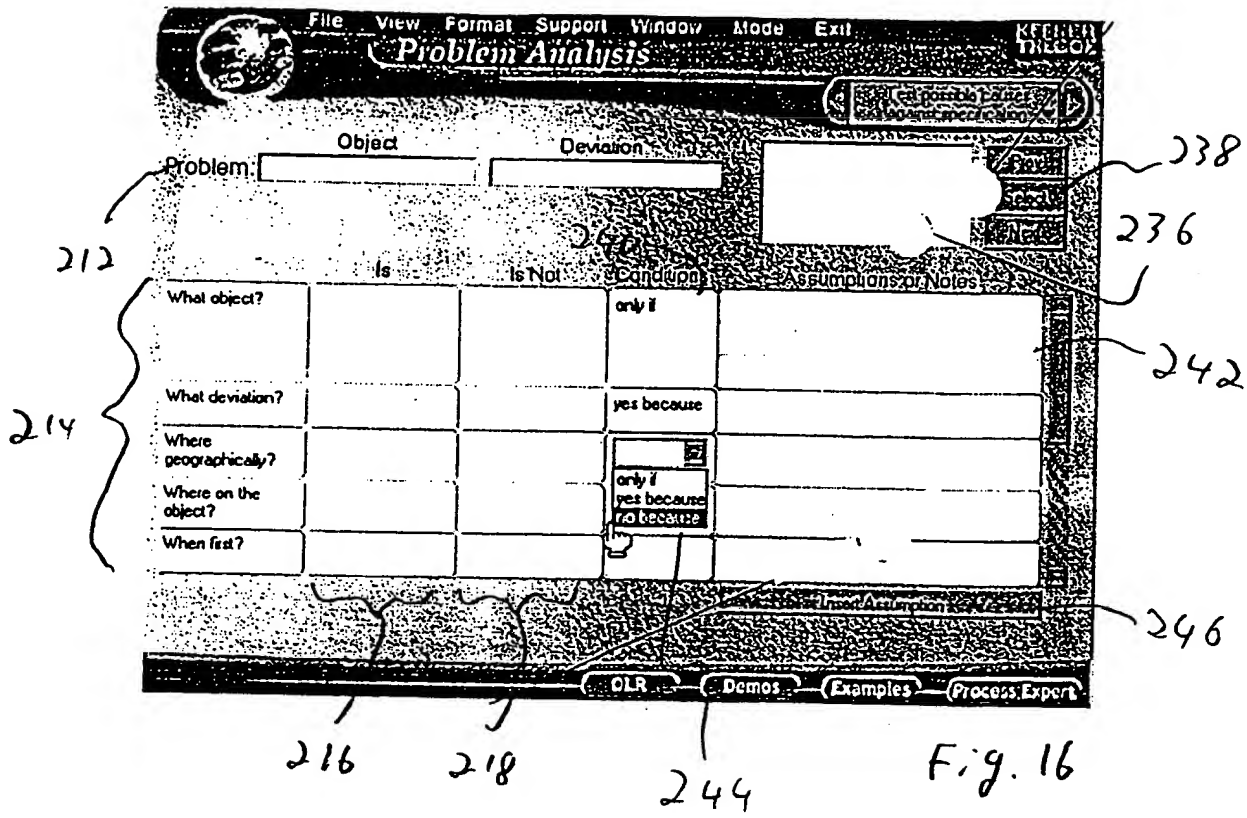

File View Format Support Window Mode Exit
Problem Analysis
KEPNER TREGOE
Object
Deviation
Problem:
Is
Is Not
Assumptions or Notes
What object?
What deviation?
Where geographically?
Where on the object?
When first?
only if
yes because
no because
OLR
Demos
Examples
Process Expert
212
214
216
218
236
238
242
244
246

Fig. 16

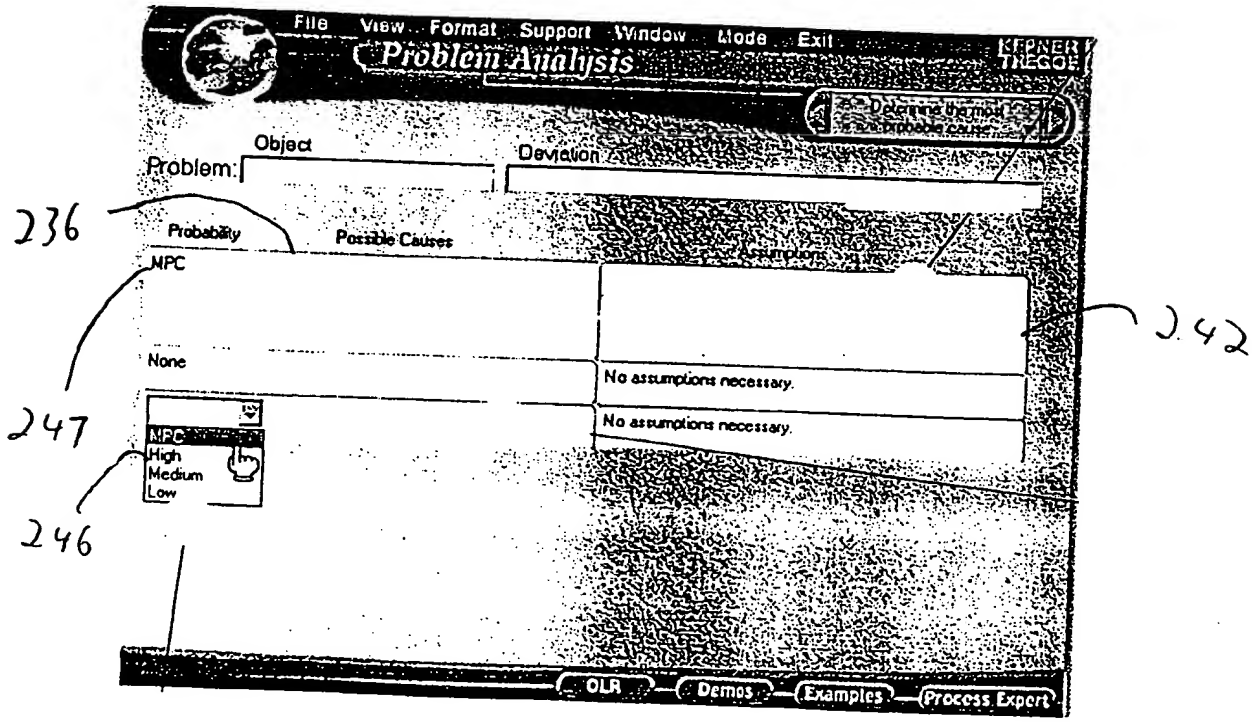

File View Format Support Window Mode Exit
Problem Analysis
KEPNER TREGOE
Object
Deviation
Problem:
Probability
Possible Causes
Assumptions
MPC
None
No assumptions necessary.
No assumptions necessary.
MPC
High
Medium
Low
OLR
Demos
Examples
Process Expert
236
242
246
247

Fig. 17

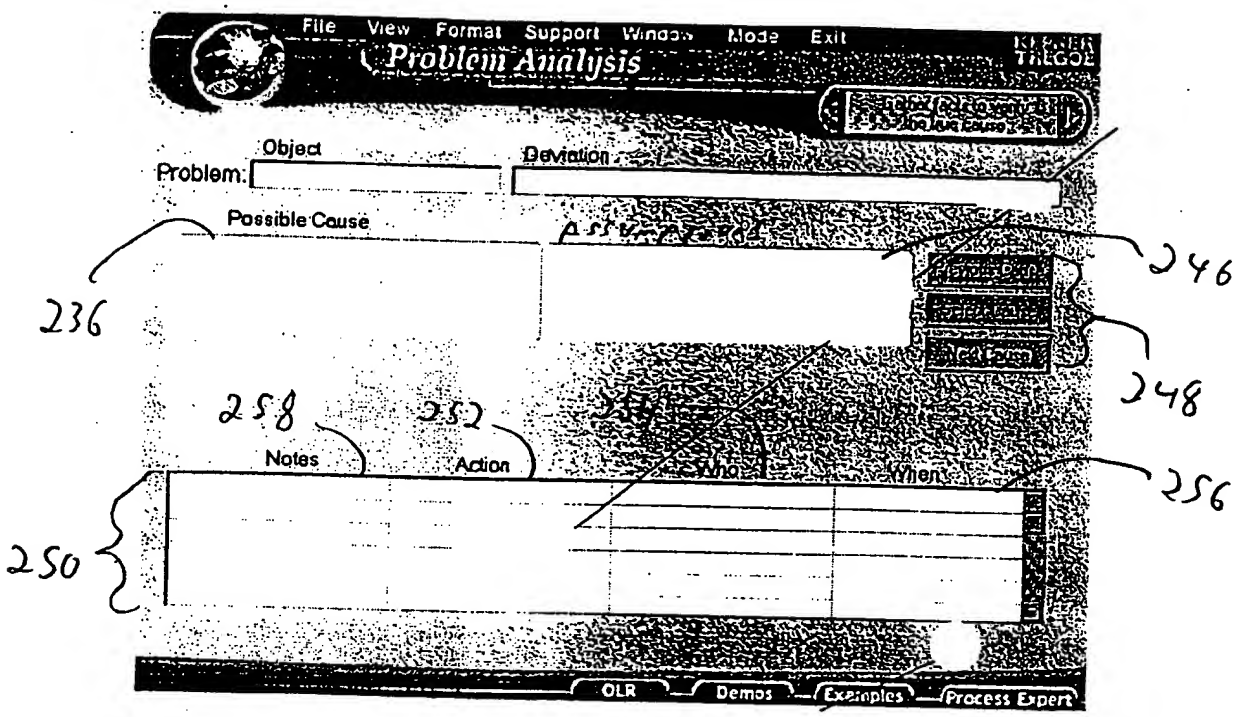

File View Format Support Window Mode Exit
Problem Analysis
Object
Problem:
Deviation
Possible Cause
236
246
248
258
252
Notes
Action
Who
When
256
250
OLR
Demos
Examples
Process Expert

Fig. 18

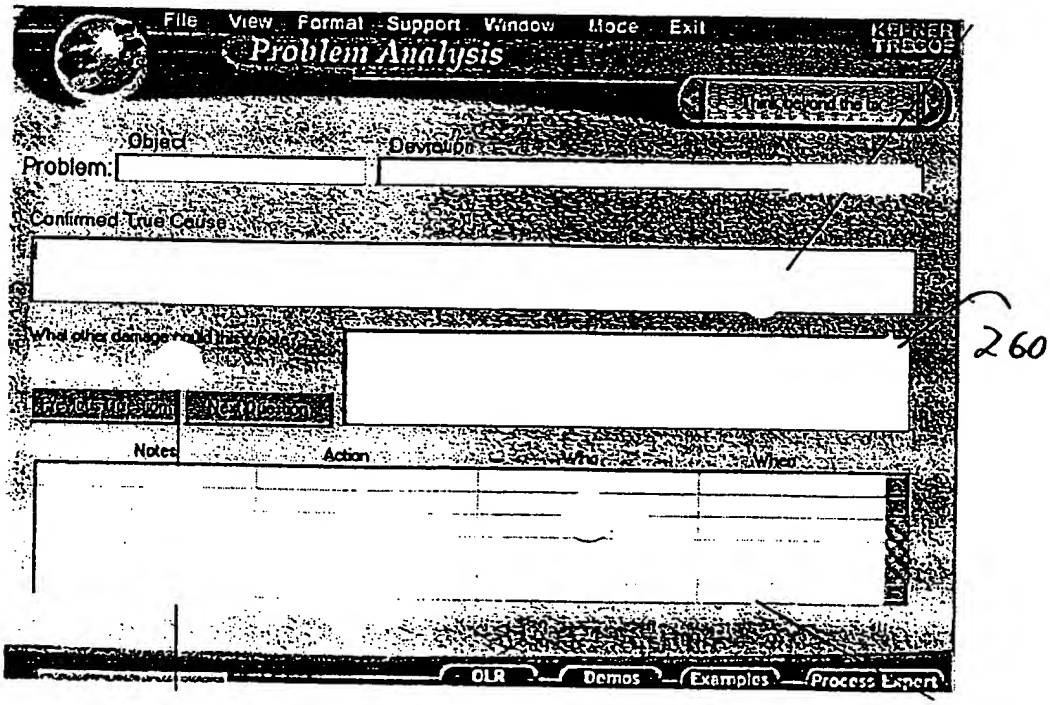

File View Format Support Window Mode Exit
Problem Analysis
Object
Problem:
Deviation
Confirmed True Cause
260
Notes
Action
Who
When
OLR
Demos
Examples
Process Expert

Fig. 19

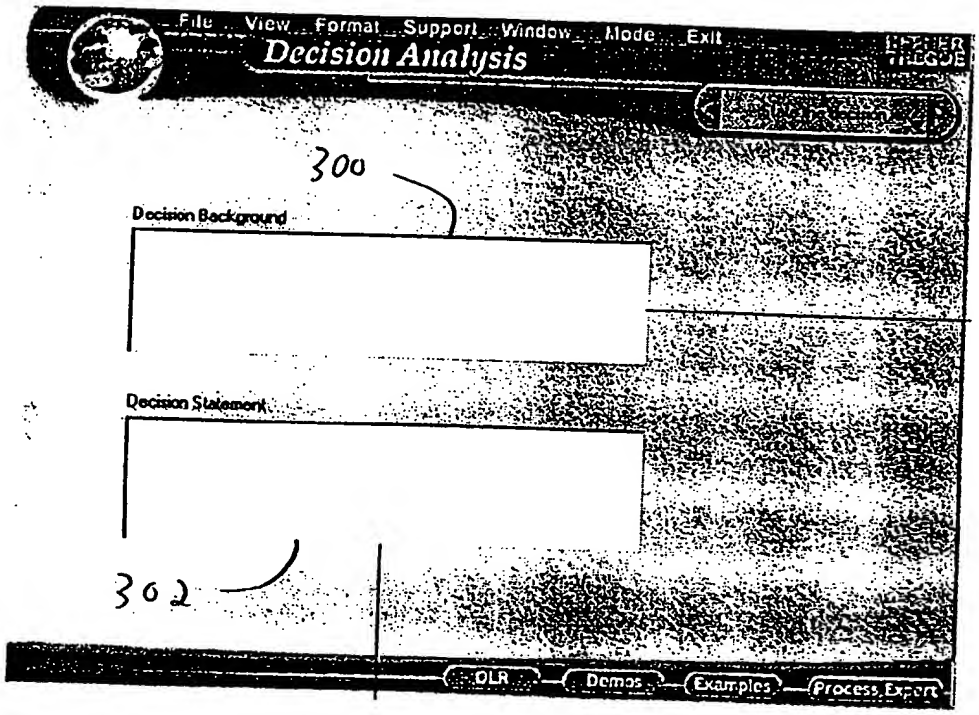

File View Format Support Window Mode Exit
Decision Analysis
300
Decision Background
Decision Statement
302
OLR
Demos
Examples
Process Expert

Fig. 20

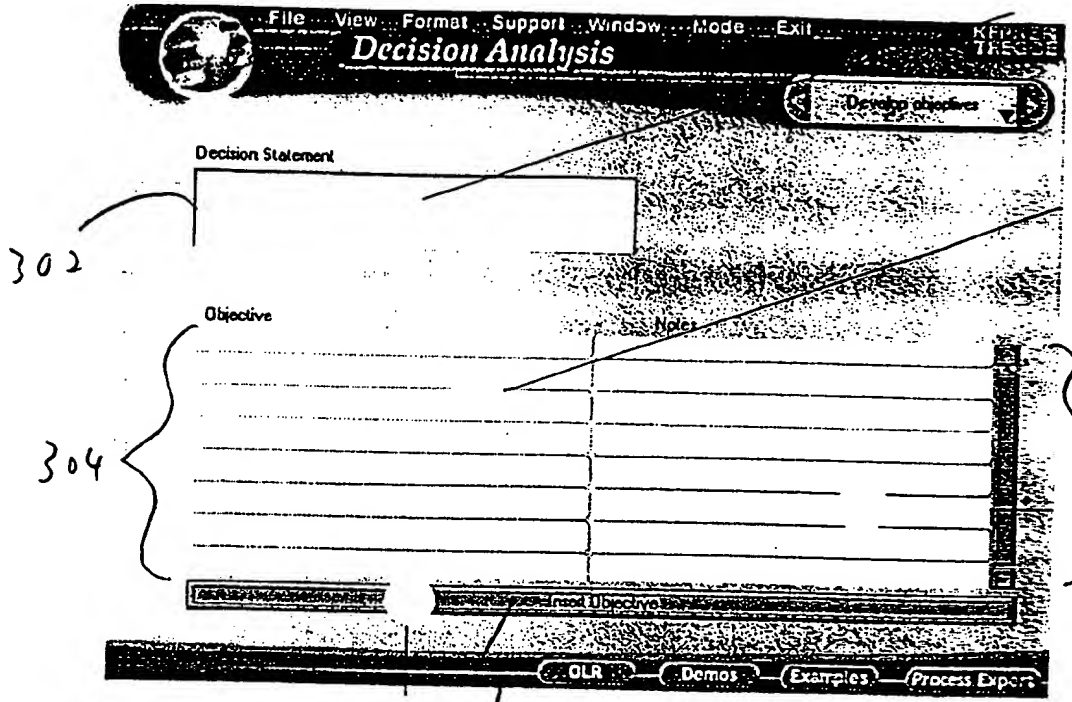

File View Format Support Window Mode Exit
Decision Analysis
Decision Statement
Objective
Notes
OLR
Demos
Examples
Process Export
302
304
306
308

Fig. 21

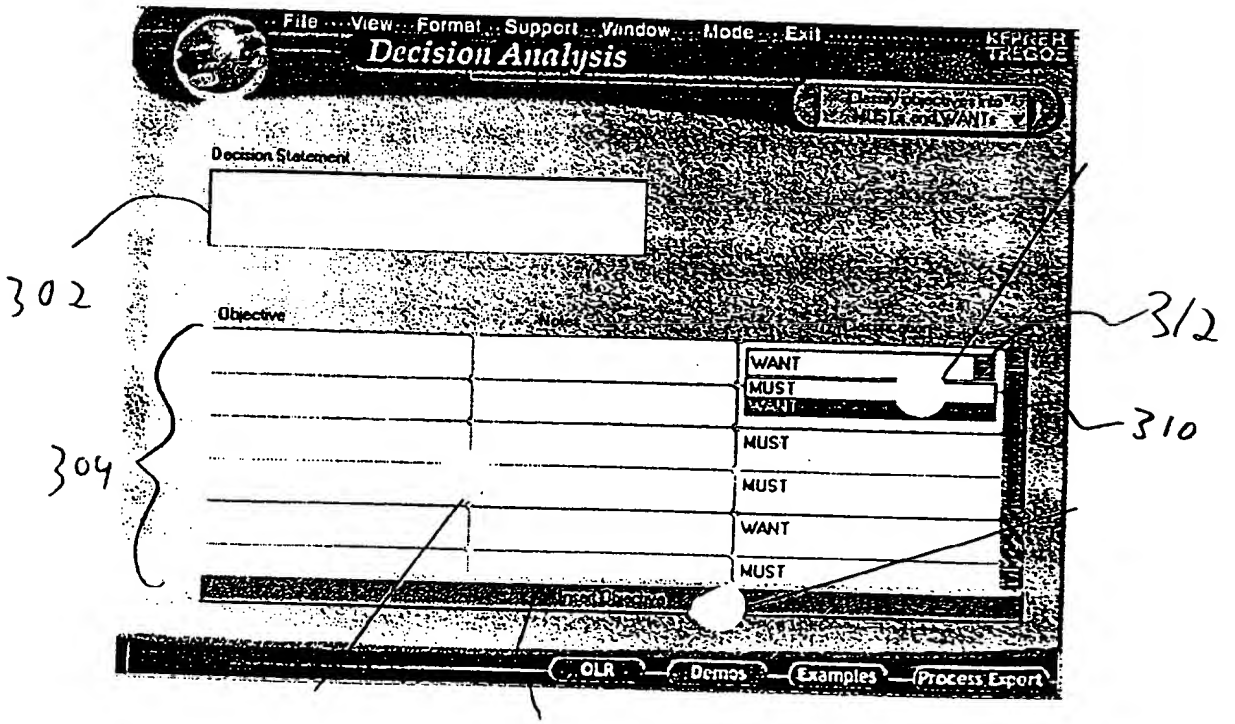

File View Format Support Window Mode Exit
Decision Analysis
Decision Statement
Objective
Notes
WANT
MUST
WANT
MUST
MUST
WANT
MUST
OLR
Demos
Examples
Process Export
302
304
308
310
312

Fig. 22

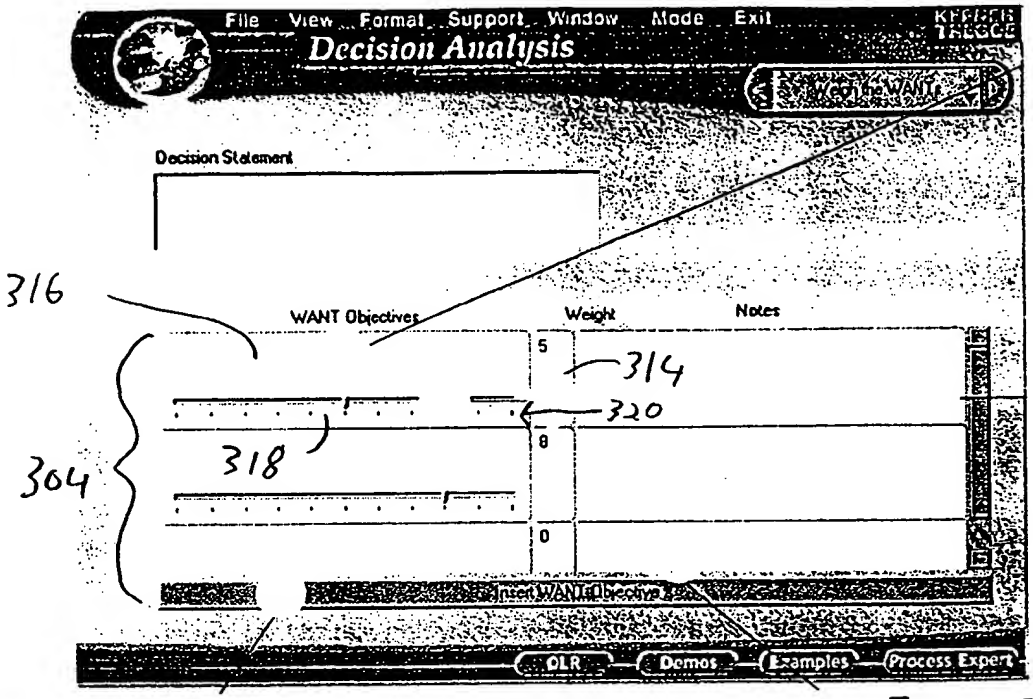

File View Format Support Window Mode Exit
Decision Analysis
Decision Statement
WANT Objectives
Weight
Notes
316
314
320
318
304
306
OLR
Demos
Examples
Process Expert

Fig. 23

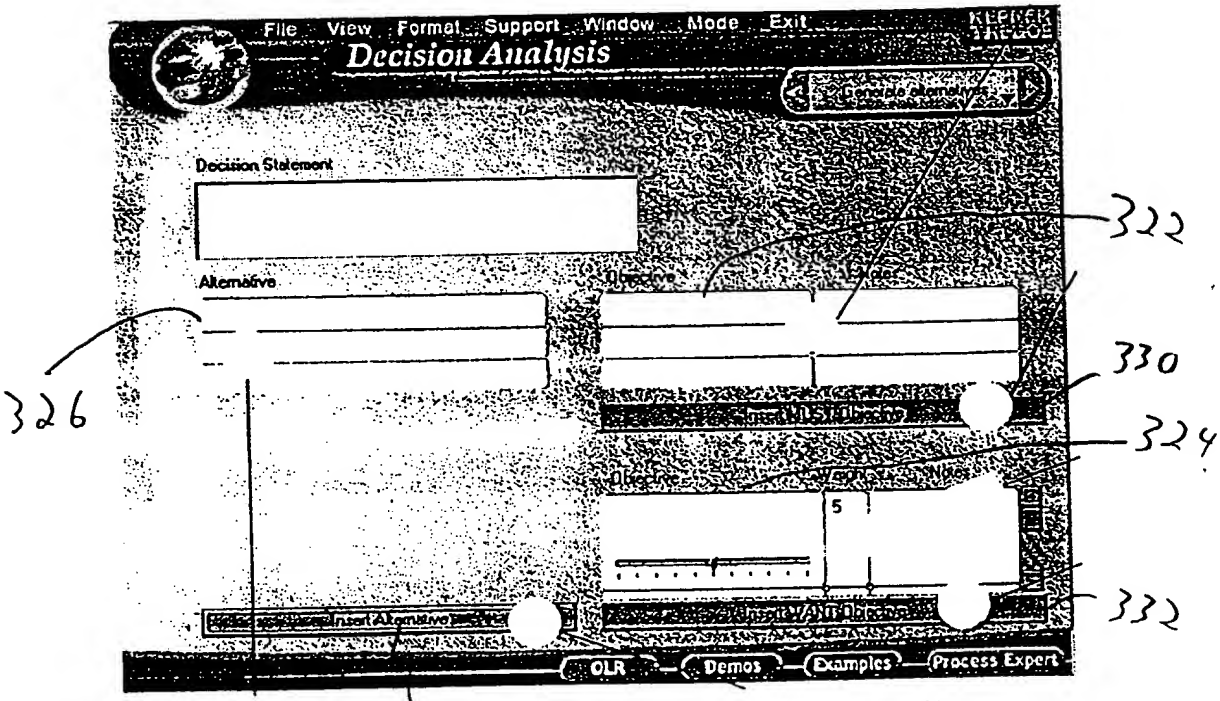

File View Format Support Window Mode Exit
Decision Analysis
Decision Statement
Alternative
Objective
322
326
330
324
332
328
OLR
Demos
Examples
Process Expert

Fig. 24

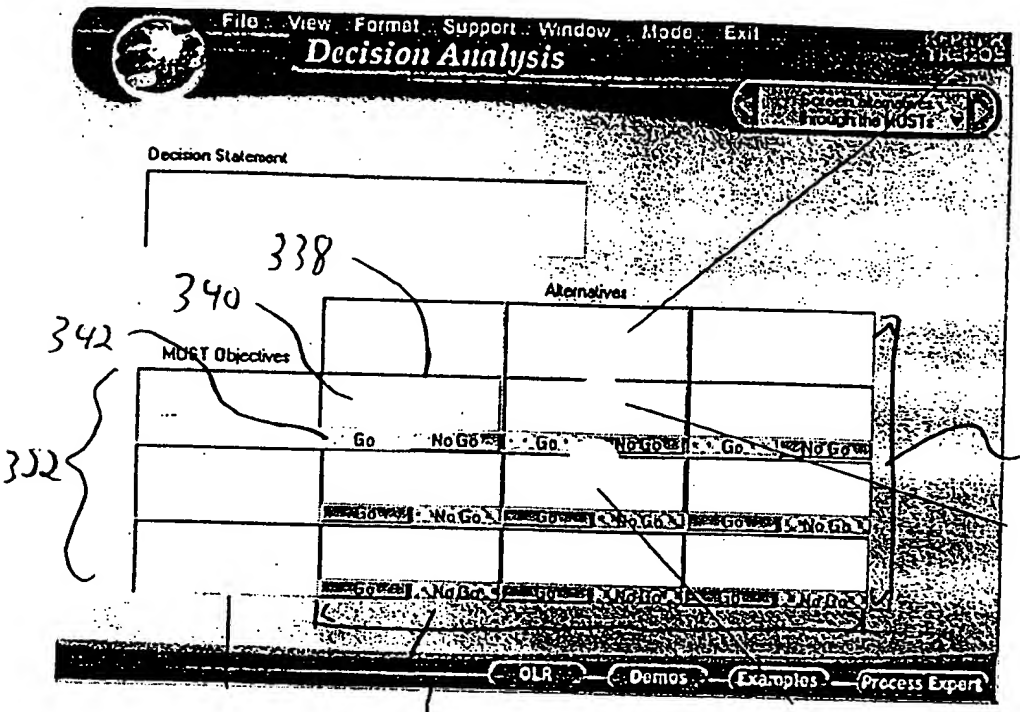

File View Format Support Window Mode Exit
Decision Analysis
Decision Statement
Alternatives
MUST Objectives
Go
No Go
OLR
Demos
Examples
Process Expert
338
340
342
332
334
336

Fig. 25

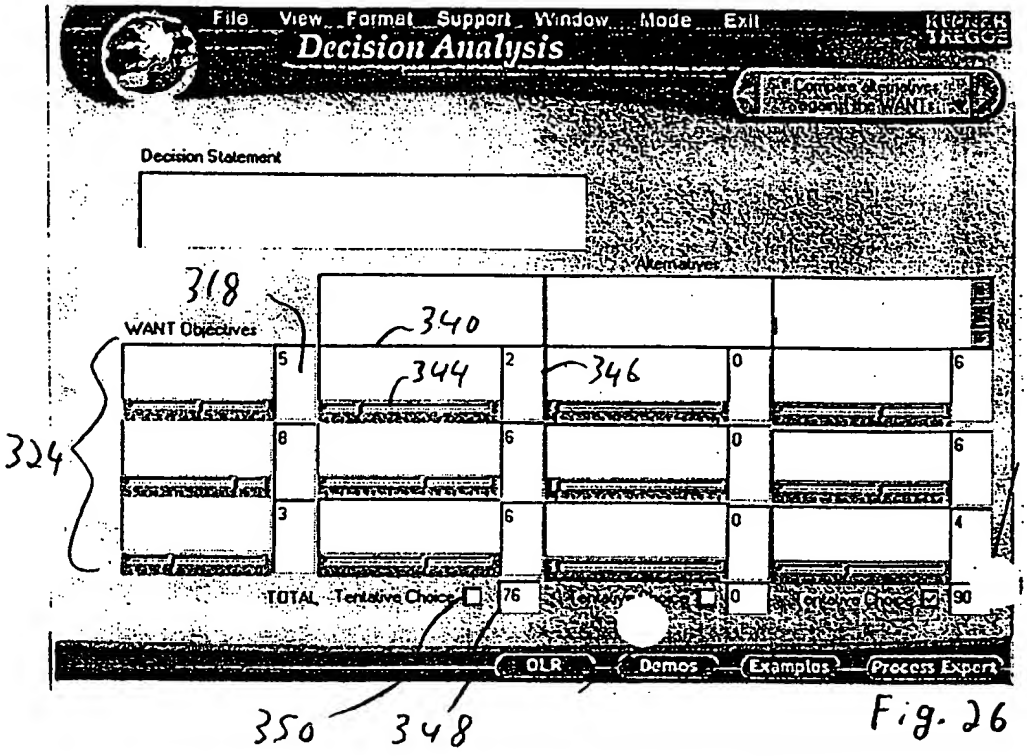

File View Format Support Window Mode Exit
Decision Analysis
Decision Statement
Alternatives
318
340
WANT Objectives
344
346
324
TOTAL Tentative Choice
76
90
OLR
Demos
Examples
Process Expert
350
348

Fig. 26

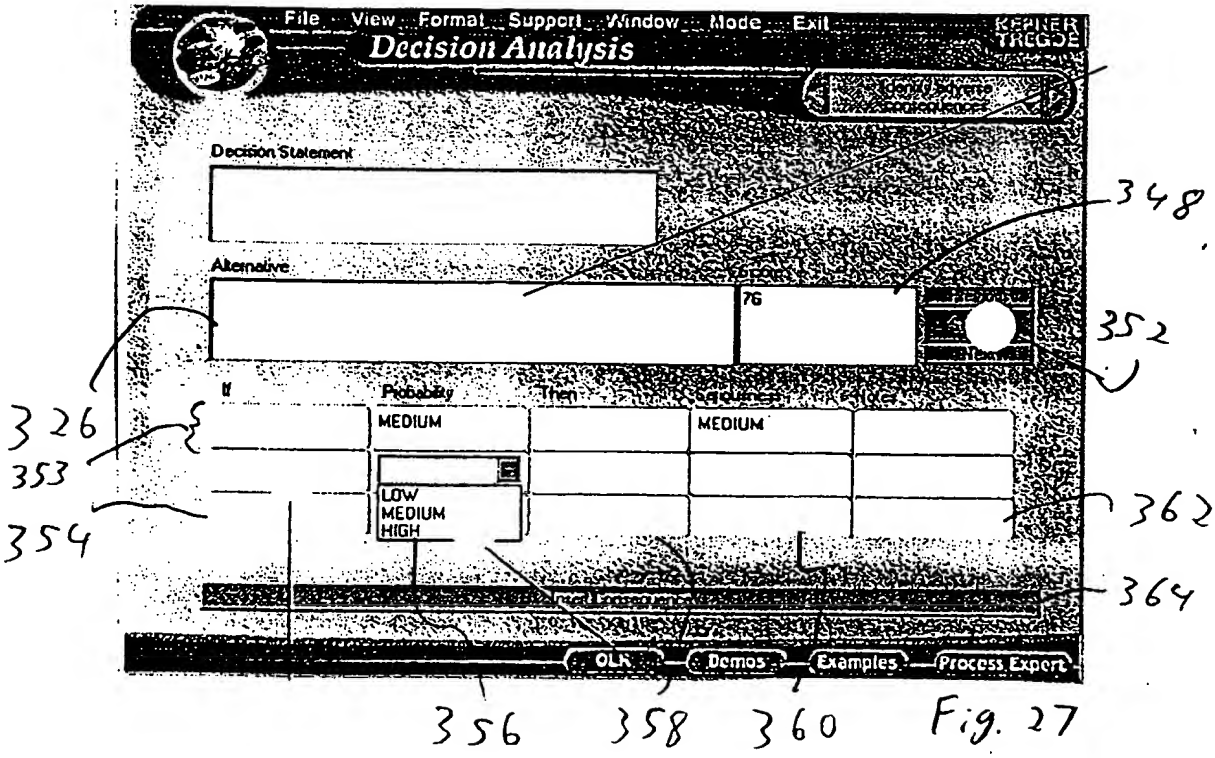

File View Format Support Window Mode Exit
Decision Analysis
Decision Statement
348
Alternative
76
352
If
Probably
Then
Goal Level
326
MEDIUM
MEDIUM
353
LOW
MEDIUM
HIGH
354
362
364
OLR
Demos
Examples
Process Expert
356
358
360

Fig. 27

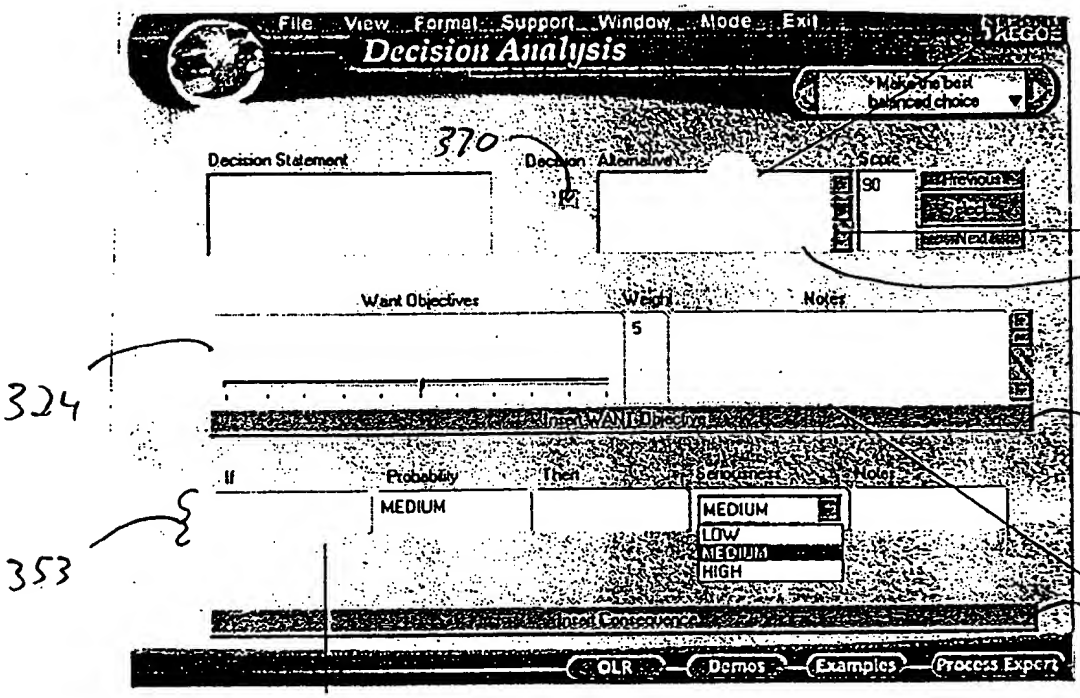

File View Format Support Window Mode Exit
Decision Analysis
Decision Statement
Decision Alternative
Scope
90
Want Objectives
Weight
Notes
5
If
Probability
Then
MEDIUM
LOW
MEDIUM
HIGH
OLR
Demos
Examples
Process Expert
370
326
324
366
353
368

Fig. 28

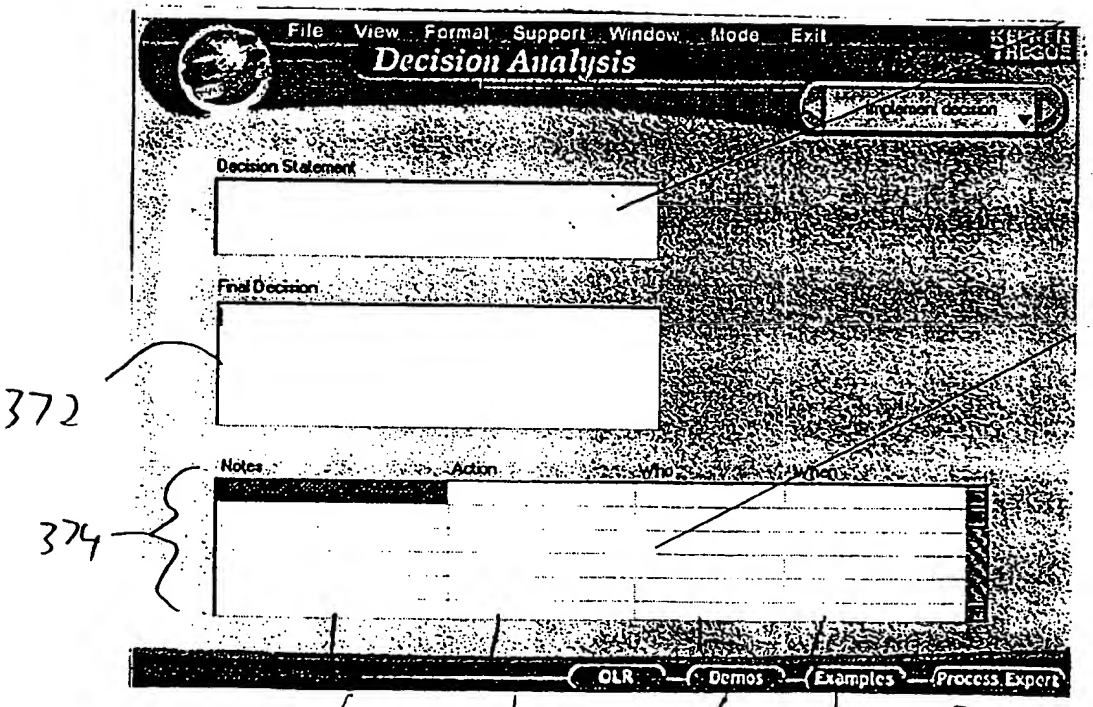

File View Format Support Window Mode Exit
Decision Analysis
Decision Statement
Final Decision
Notes
Action
Who
When
OLR
Demos
Examples
Process Expert
372
374
382
376
378
380

Fig. 29

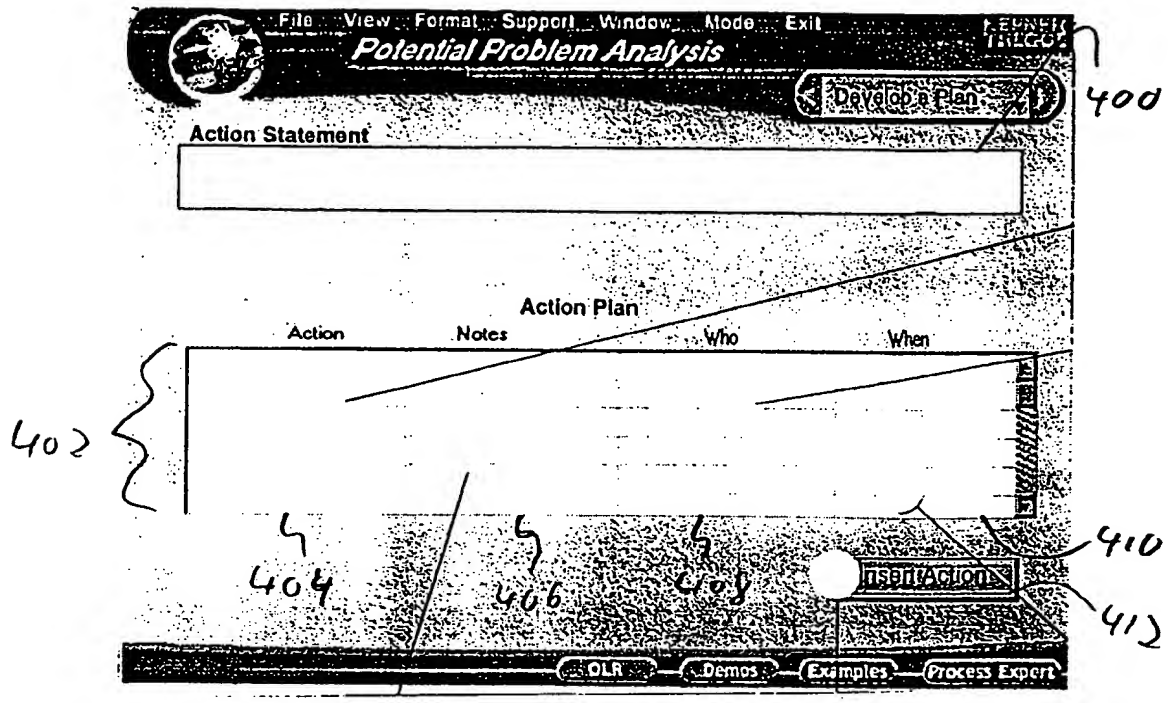

File View Format Support Window Mode Exit
Potential Problem Analysis
Develop a Plan
Action Statement
Action Plan
Action
Notes
Who
When
402
404
406
408
410
InsertAction
412
OLR
Demos
Examples
Process Expert

Fig. 30

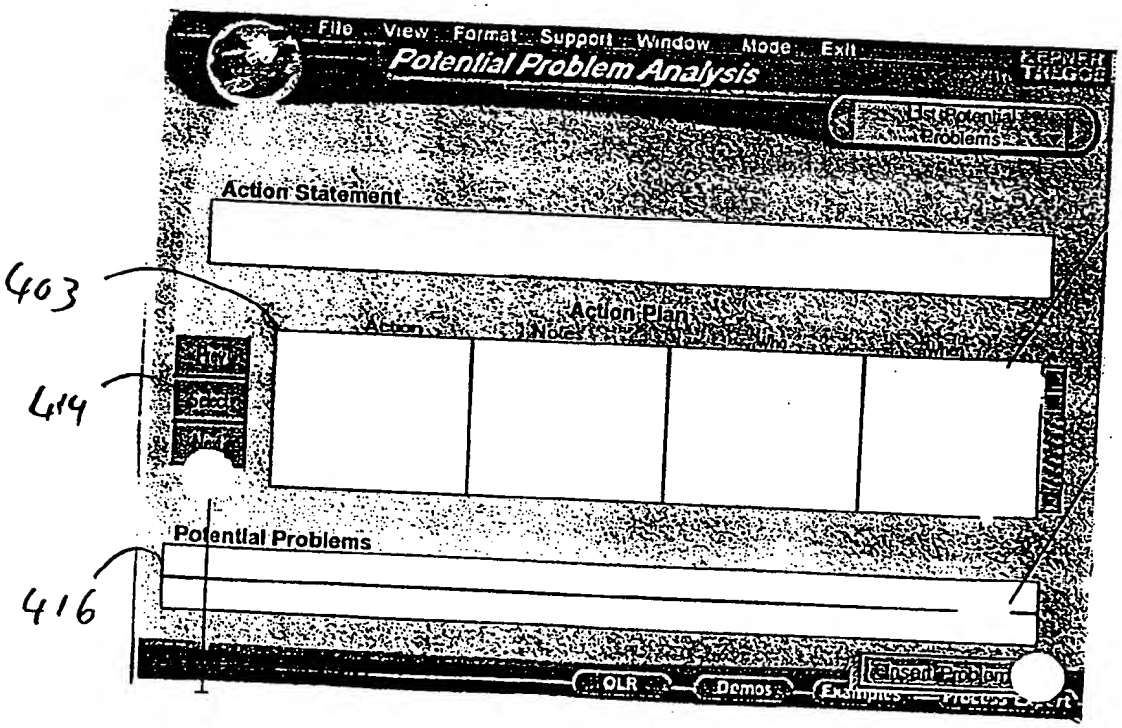

File View Format Support Window Mode Exit
Potential Problem Analysis
List Potential Problems
Action Statement
403
Action Plan
Action
Notes
414
Potential Problems
416
OLR
Demos

Fig. 31

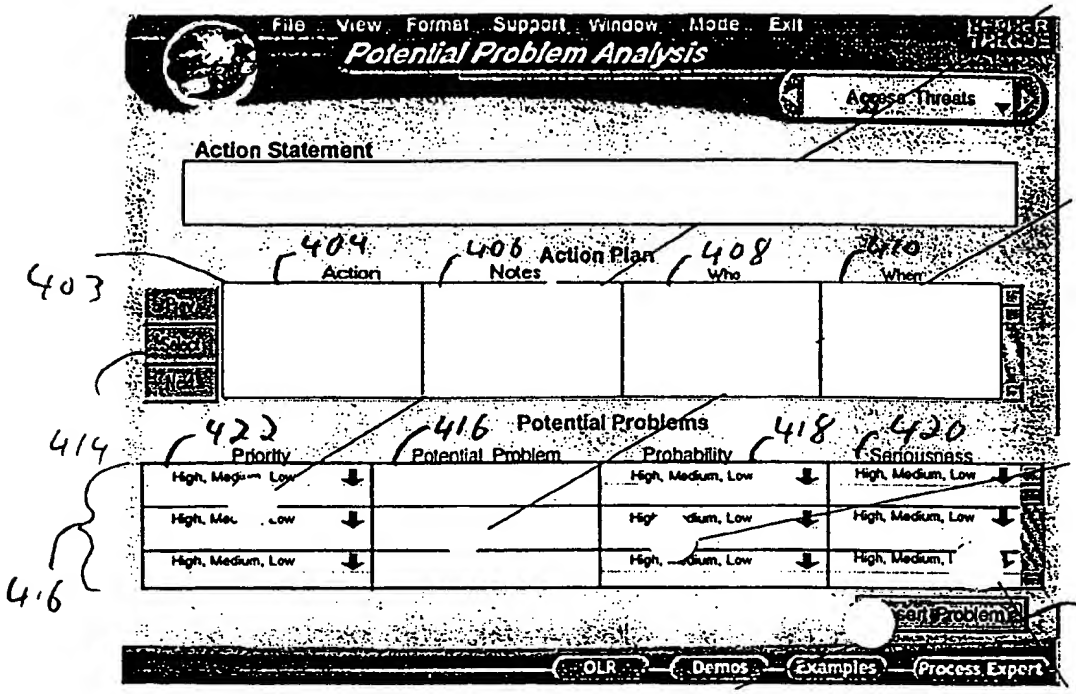

File View Format Support Window Mode Exit
Potential Problem Analysis
Access Threats
Action Statement
403
404 Action
406 Action Plan Notes
408 Who
410 When
414
416
422 Priority
416 Potential Problem
Potential Problems
418 Probability
420 Seriousness
High, Medium, Low
424
OLR
Demos
Examples
Process Expert

Fig. 32

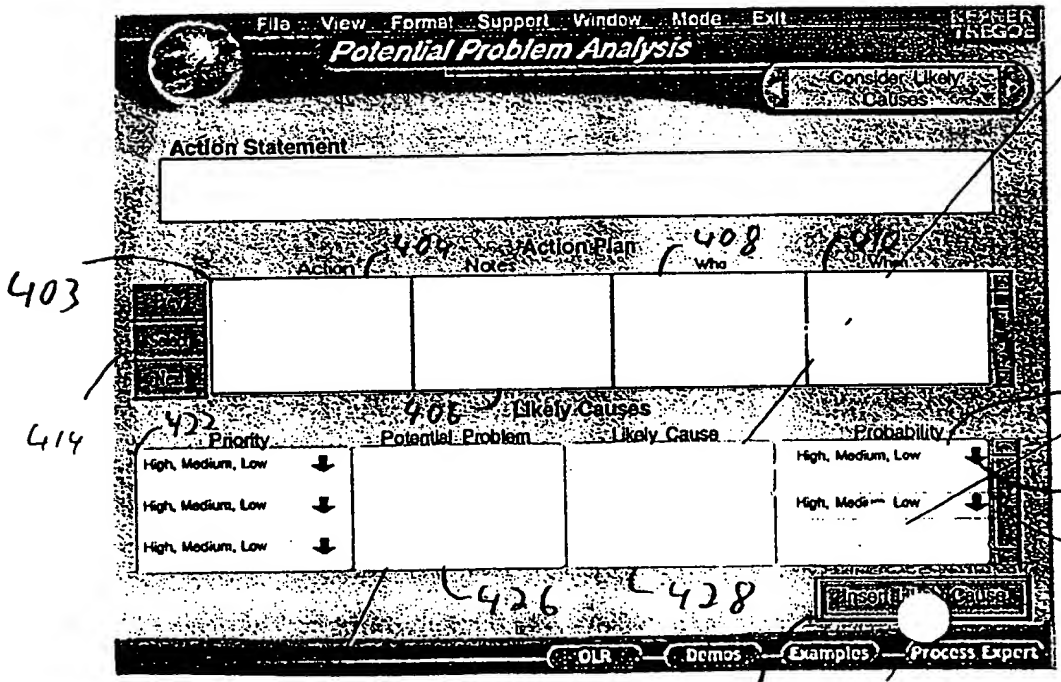

File View Format Support Window Mode Exit
Potential Problem Analysis
Consider Likely Causes
Action Statement
403
404 Action
406 Action Plan Notes
408 Who
410 When
414
422 Priority
406 Likely Causes
Potential Problem
Likely Cause
Probability
430
432
434
High, Medium, Low
426
428
Insert
Cause
OLR
Demos
Examples
Process Expert
436

Fig. 33

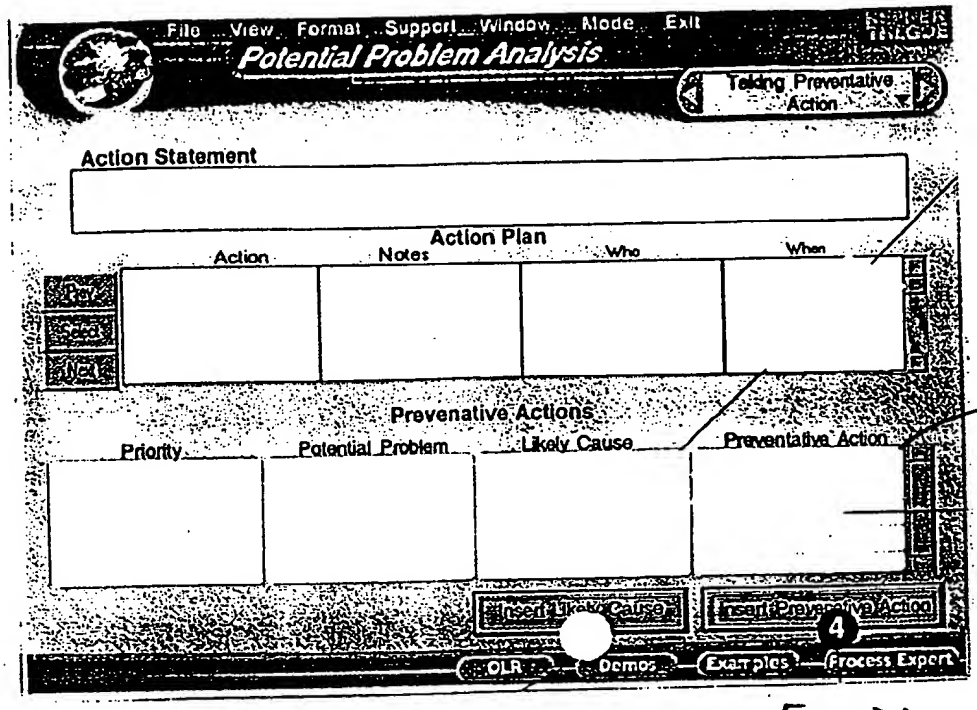

File View Format Support Window Mode Exit
Potential Problem Analysis
Taking Preventative Action
Action Statement
Action Plan
Action
Notes
Who
When
Prevenative Actions
Priority
Potential Problem
Likely Cause
Preventative Action
438
Insert Likely Cause
Insert Preventative Action
4
OLR
Demos
Examples
Process Expert

Fig. 34

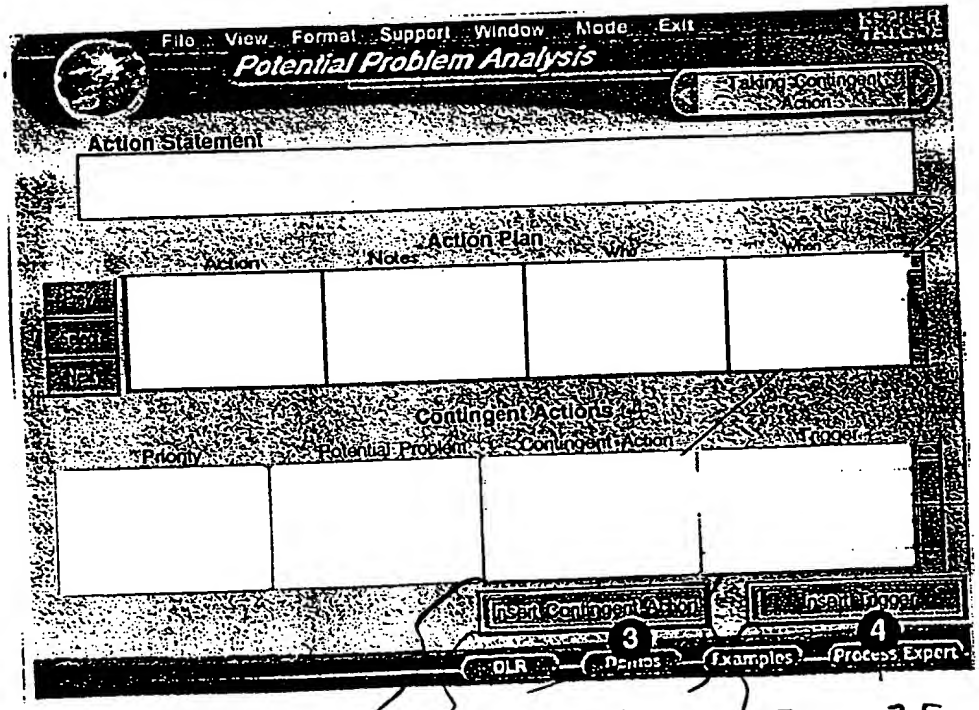

File View Format Support Window Mode Exit
Potential Problem Analysis
Taking Contingent Actions
Action Statement
Action Plan
Action
Notes
Who
When
Contingent Actions
Priority
Potential Problem
Contingent Action
Trigger
Insert Contingent Action
Insert Trigger
3
4
OLR
Demos
Examples
Process Expert
439
442
440
444

Fig. 35

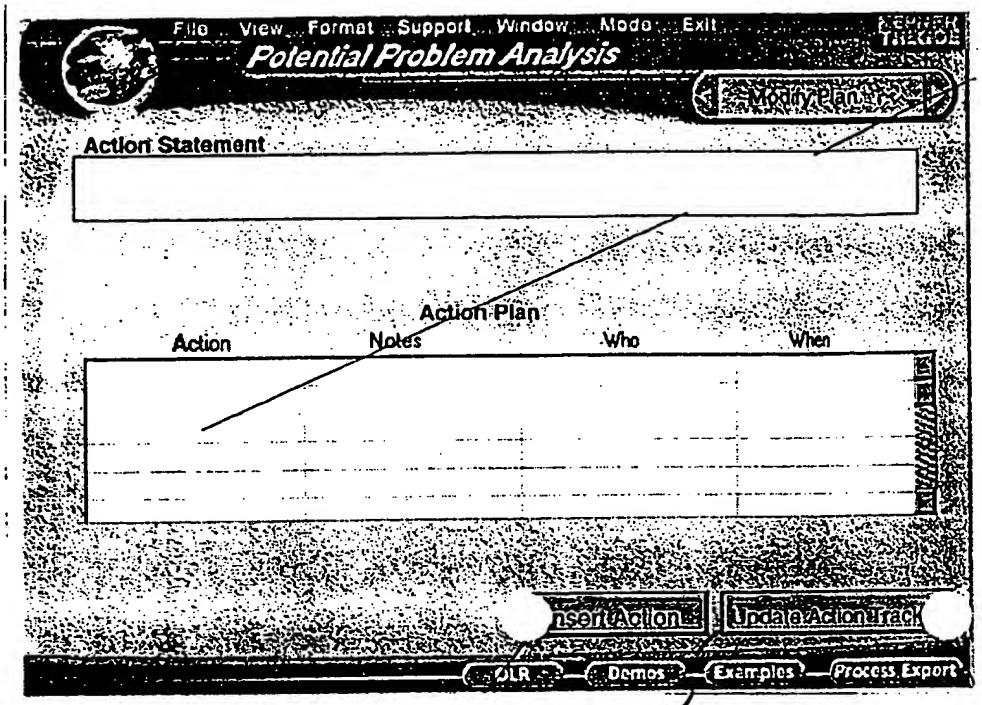

File View Format Support Window Mode Exit
Potential Problem Analysis
Modify Plan
Action Statement
Action Plan
Action
Notes
Who
When
Insert Action
Update Action Track
OLR
Demos
Examples
Process Export
446

Fig. 36

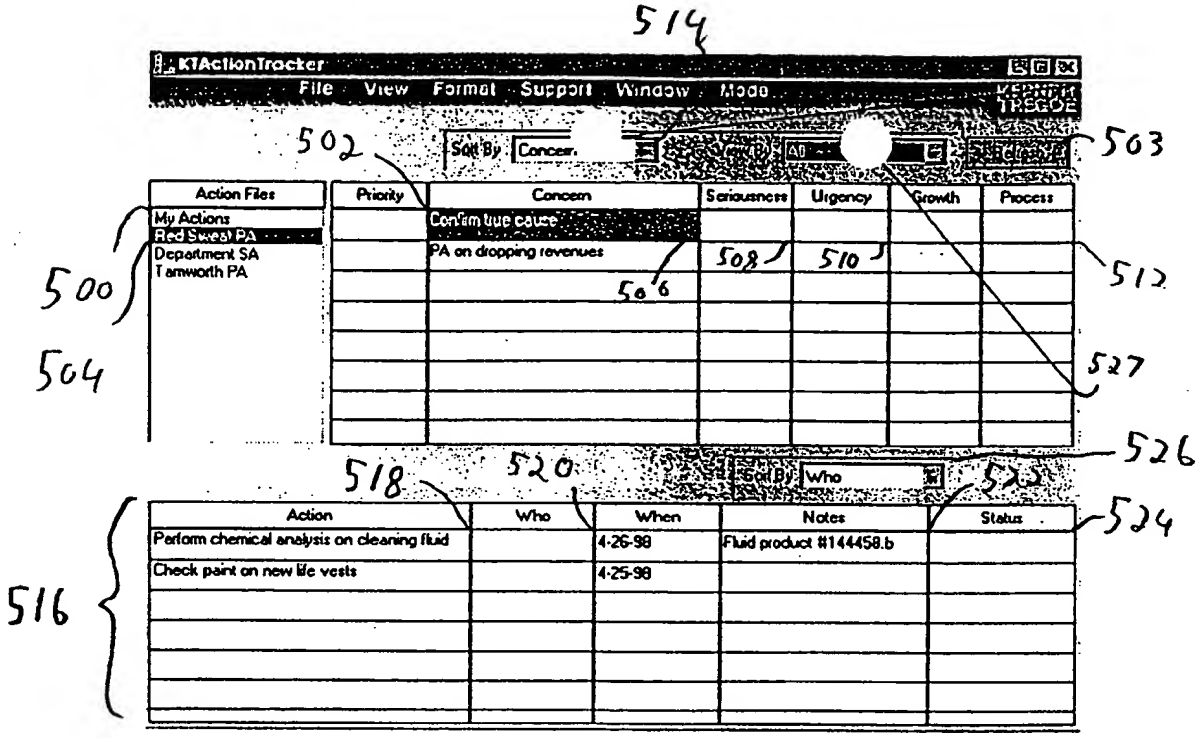

514
KTActionTracker
File View Format Support Window Mode
Sort By: Concern
502
503
Action Files
My Actions
Red Sweep PA
Department SA
Tamworth PA
500
504
Priority
Concern
Seriousness
Urgency
Growth
Process
Confirm true cause
PA on dropping revenues
508
510
506
512
527
526
518
520
Sort By: Who
522
524
Action
Who
When
Notes
Status
Perform chemical analysis on cleaning fluid
4-26-98
Fluid product #144458.b
Check paint on new life vests
4-25-98
516

Fig. 37

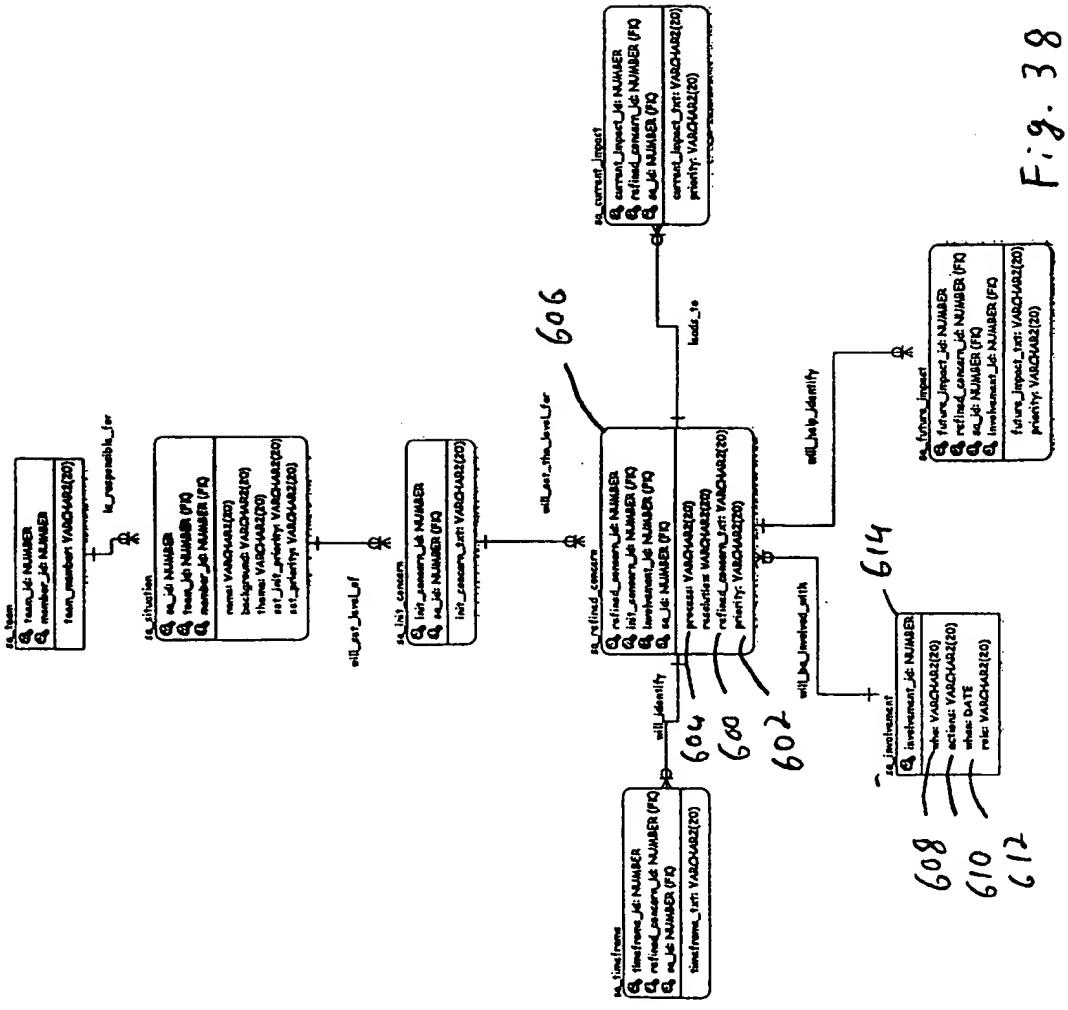


Fig. 38

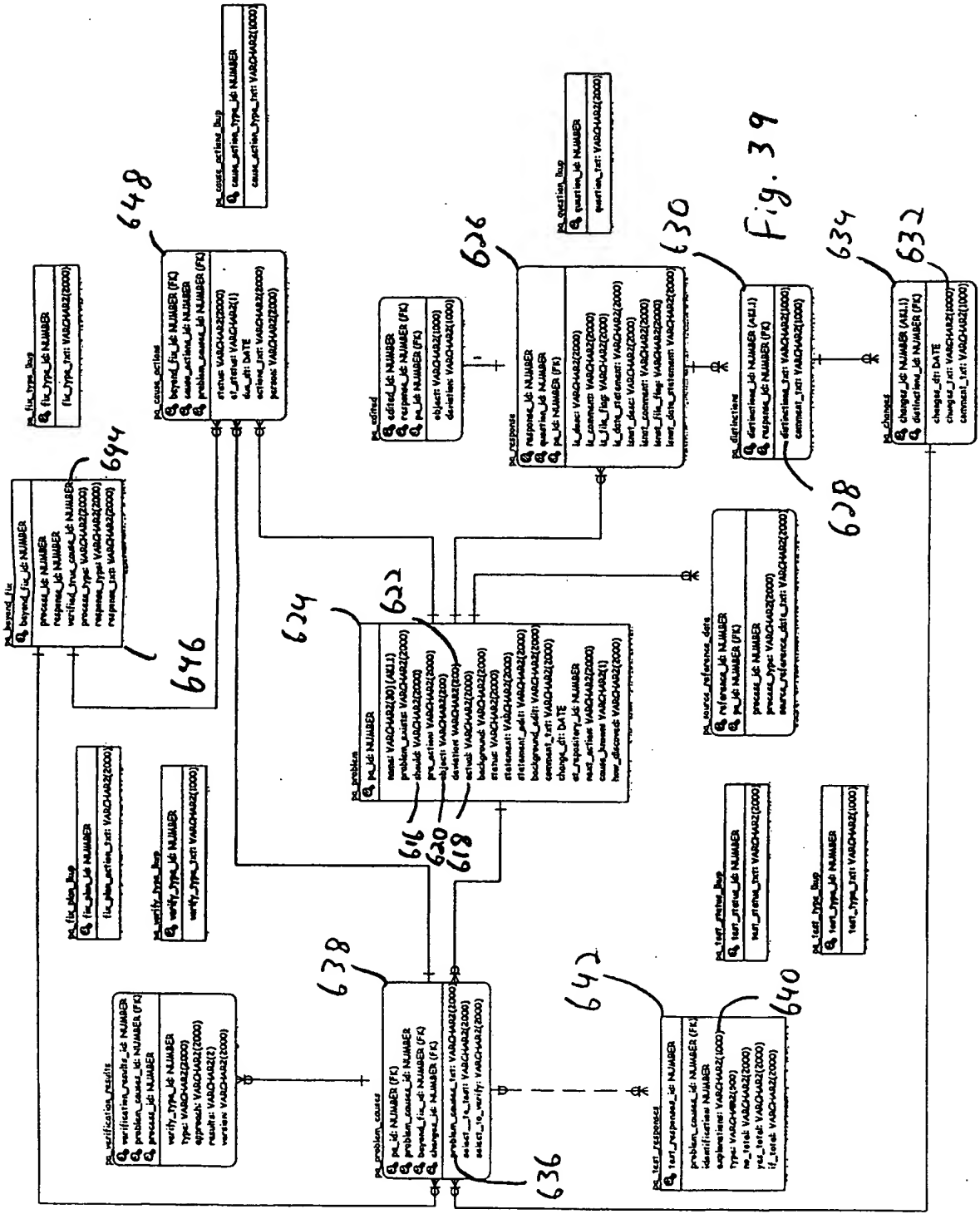


Fig. 39

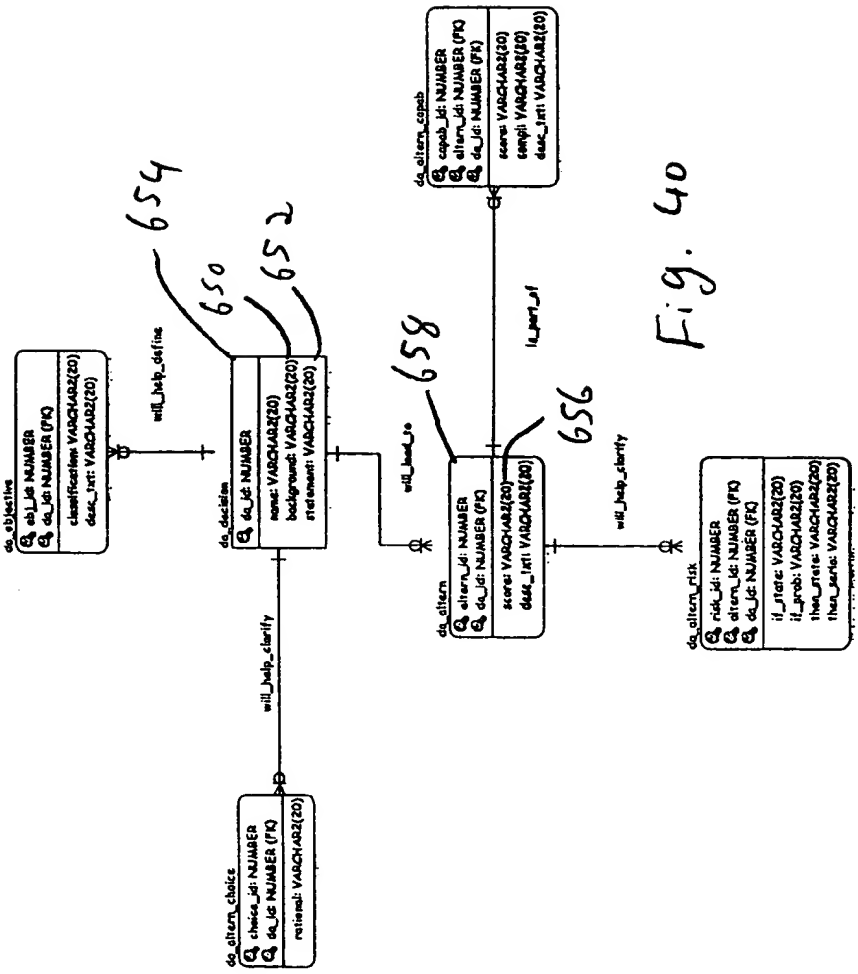

654
650
652
658
656
will_help_define
will_help_clarify
will_help_clarify
will_bond_to
is_part_of
do_objective
obj_id: NUMBER
dq_id: NUMBER (FK)
classification: VARCHAR2(20)
desc_txt: VARCHAR2(20)
dq_decision
dq_id: NUMBER
name: VARCHAR2(30)
background: VARCHAR2(20)
statement: VARCHAR2(20)
dq_alt_choice
choice_id: NUMBER
dq_id: NUMBER (FK)
rationale: VARCHAR2(20)
dq_alt_capab
capab_id: NUMBER
altern_id: NUMBER (FK)
dq_id: NUMBER (FK)
score: VARCHAR2(20)
compl: VARCHAR2(20)
desc_txt1: VARCHAR2(20)
dq_alt
altern_id: NUMBER
dq_id: NUMBER (FK)
score: VARCHAR2(20)
desc_txt1: VARCHAR2(20)
dq_alt_risk
risk_id: NUMBER
altern_id: NUMBER (FK)
dq_id: NUMBER (FK)
il_rate: VARCHAR2(20)
il_prob: VARCHAR2(20)
thru_rate: VARCHAR2(20)
thru_perfo: VARCHAR2(20)

Fig. 40

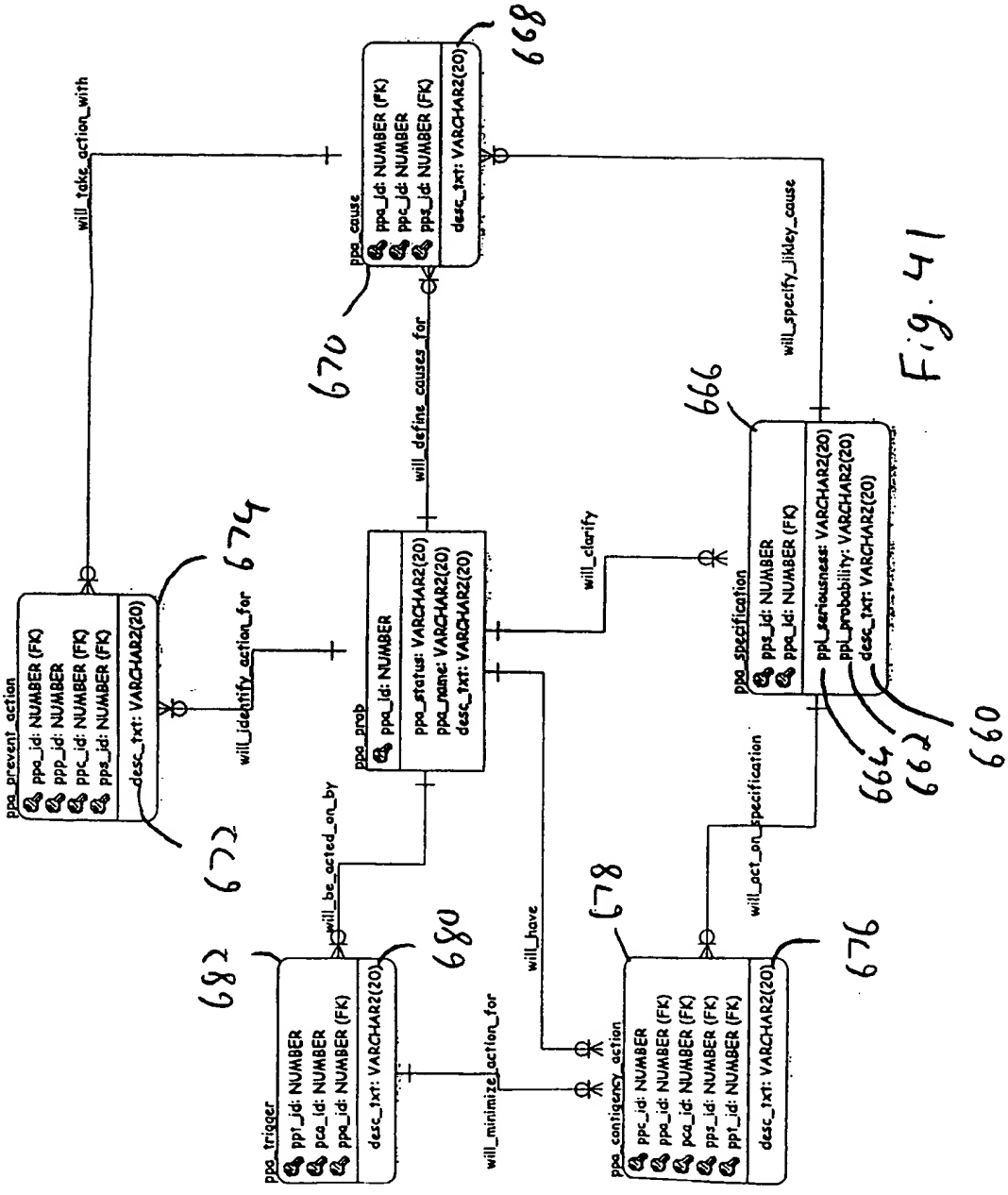

ppa_prevent_action
ppa_id: NUMBER (FK)
ppp_id: NUMBER
ppc_id: NUMBER (FK)
pps_id: NUMBER (FK)
desc_txt: VARCHAR2(20)
will_take_action_with
will_identify_action_for
ppa_cause
ppa_id: NUMBER (FK)
ppc_id: NUMBER
pps_id: NUMBER (FK)
desc_txt: VARCHAR2(20)
will_define_causes_for
ppa_prob
ppa_id: NUMBER
ppa_status: VARCHAR2(20)
ppa_name: VARCHAR2(20)
desc_txt: VARCHAR2(20)
will_be_acted_on_by
will_clarify
ppa_specification
pps_id: NUMBER
ppa_id: NUMBER (FK)
ppl_seriousness: VARCHAR2(20)
ppl_probability: VARCHAR2(20)
desc_txt: VARCHAR2(20)
will_specify_likley_cause
will_act_on_specification
ppa_trigger
ppt_id: NUMBER
pca_id: NUMBER
ppa_id: NUMBER (FK)
desc_txt: VARCHAR2(20)
will_minimize_action_for
will_have
ppa_contigency_action
ppc_id: NUMBER
ppa_id: NUMBER (FK)
pca_id: NUMBER (FK)
pps_id: NUMBER (FK)
ppt_id: NUMBER (FK)
desc_txt: VARCHAR2(20)
672
674
676
678
680
682
660
662
664
666
668
670

Fig. 41

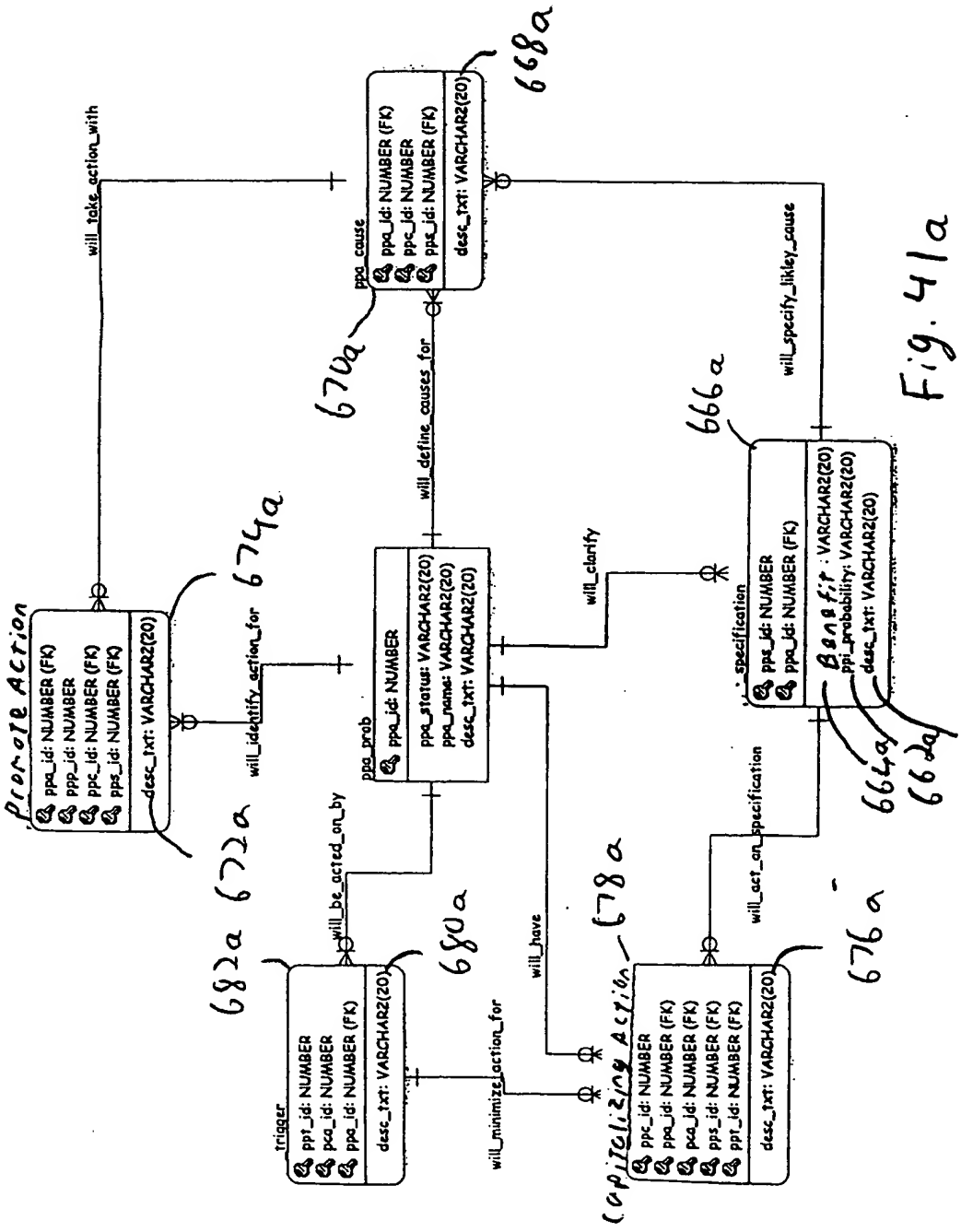

Prevent Action
ppa_id: NUMBER (FK)
ppp_id: NUMBER
ppc_id: NUMBER (FK)
pps_id: NUMBER (FK)
desc_txt: VARCHAR2(20)
will_take_action_with
will_identify_action_for
will_be_acted_on_by
will_minimize_action_for
will_define_causes_for
will_clarify
will_have
will_act_on_specification
will_specify_likley_cause
ppa_prob
ppa_id: NUMBER
ppa_status: VARCHAR2(20)
ppa_name: VARCHAR2(20)
desc_txt: VARCHAR2(20)
ppa_cause
ppa_id: NUMBER (FK)
ppc_id: NUMBER
pps_id: NUMBER (FK)
desc_txt: VARCHAR2(20)
trigger
ppt_id: NUMBER
pca_id: NUMBER
ppa_id: NUMBER (FK)
desc_txt: VARCHAR2(20)
Capitalizing Action
ppc_id: NUMBER
ppa_id: NUMBER (FK)
pca_id: NUMBER (FK)
pps_id: NUMBER (FK)
ppt_id: NUMBER (FK)
desc_txt: VARCHAR2(20)
specification
ppa_id: NUMBER
ppa_id: NUMBER (FK)
Benefit: VARCHAR2(20)
ppl_probability: VARCHAR2(20)
desc_txt: VARCHAR2(20)
672a
674a
668a
682a
680a
678a
666a
664a
662a
676a
660a

Fig. 41a

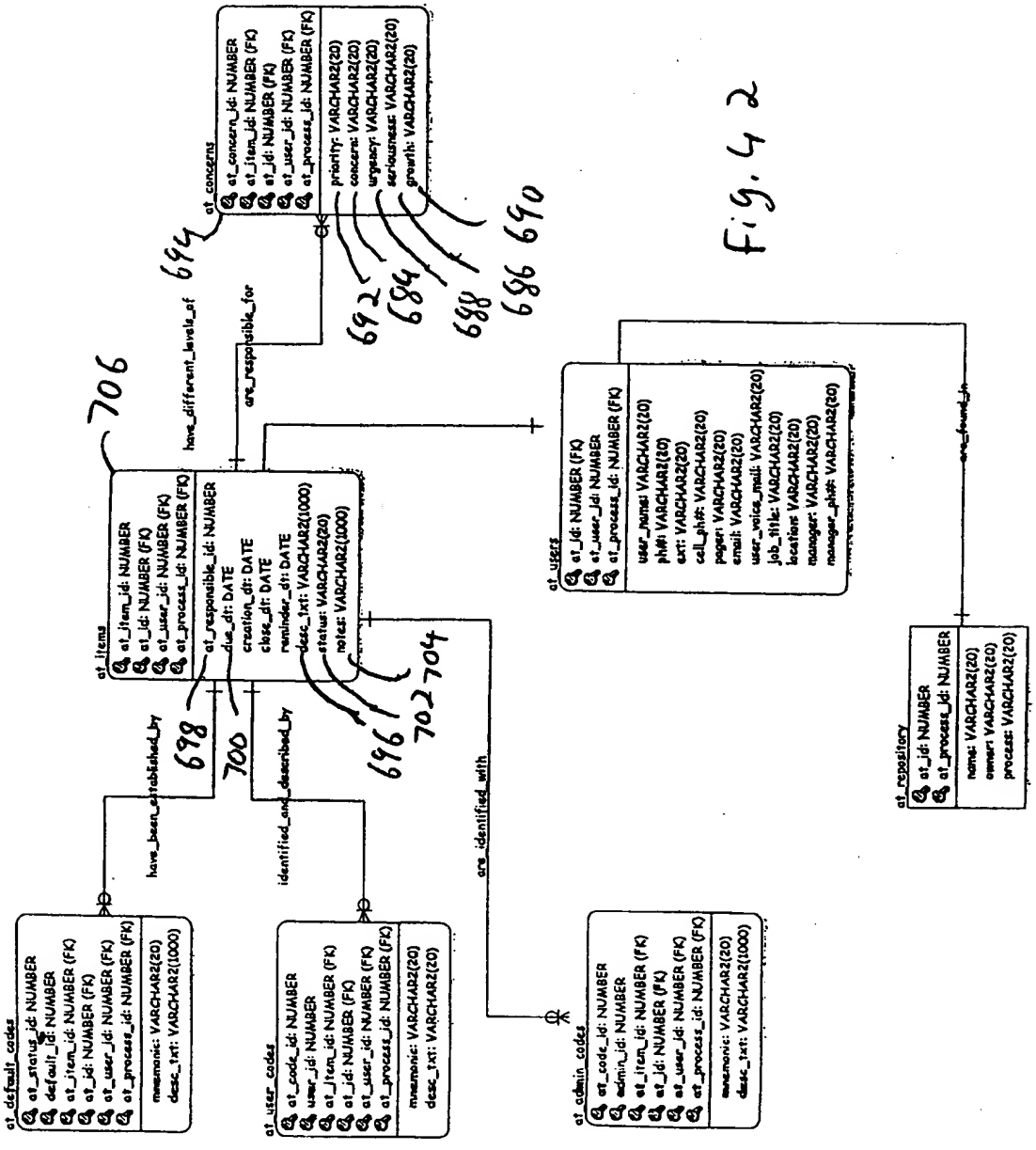

at_default_codes
at_status_id: NUMBER
default_id: NUMBER
at_item_id: NUMBER (FK)
at_id: NUMBER (FK)
at_user_id: NUMBER (FK)
at_process_id: NUMBER (FK)
mnemonic: VARCHAR2(20)
desc_txt: VARCHAR2(1000)
have_been_established_by
at_user_codes
at_code_id: NUMBER
user_id: NUMBER
at_item_id: NUMBER (FK)
at_id: NUMBER (FK)
at_user_id: NUMBER (FK)
at_process_id: NUMBER (FK)
mnemonic: VARCHAR2(20)
desc_txt: VARCHAR2(20)
identified_and_described_by
at_items
at_item_id: NUMBER
at_id: NUMBER (FK)
at_user_id: NUMBER (FK)
at_process_id: NUMBER (FK)
at_responsible_id: NUMBER
due_dt: DATE
creation_dt: DATE
close_dt: DATE
reminder_dt: DATE
desc_txt: VARCHAR2(1000)
status: VARCHAR2(20)
notes: VARCHAR2(1000)
have_different_levels_of
are_responsible_for
at_concerns
at_concern_id: NUMBER
at_item_id: NUMBER (FK)
at_id: NUMBER (FK)
at_user_id: NUMBER (FK)
at_process_id: NUMBER (FK)
priority: VARCHAR2(20)
concern: VARCHAR2(20)
urgency: VARCHAR2(20)
seriousness: VARCHAR2(20)
growth: VARCHAR2(20)
are_identified_with
at_admin_codes
at_code_id: NUMBER
admin_id: NUMBER
at_item_id: NUMBER (FK)
at_id: NUMBER (FK)
at_user_id: NUMBER (FK)
at_process_id: NUMBER (FK)
mnemonic: VARCHAR2(20)
desc_txt: VARCHAR2(1000)
at_users
at_id: NUMBER (FK)
at_user_id: NUMBER
at_process_id: NUMBER (FK)
user_name: VARCHAR2(20)
phN: VARCHAR2(20)
ext: VARCHAR2(20)
cell_phN: VARCHAR2(20)
pager: VARCHAR2(20)
email: VARCHAR2(20)
user_voice_mail: VARCHAR2(20)
job_title: VARCHAR2(20)
location: VARCHAR2(20)
manager: VARCHAR2(20)
manager_phN: VARCHAR2(20)
are_found_in
at_repository
at_id: NUMBER
at_process_id: NUMBER
name: VARCHAR2(20)
owner: VARCHAR2(20)
process: VARCHAR2(20)
706
694
692
684
688
686
690
698
700
696
702
704

Fig. 42

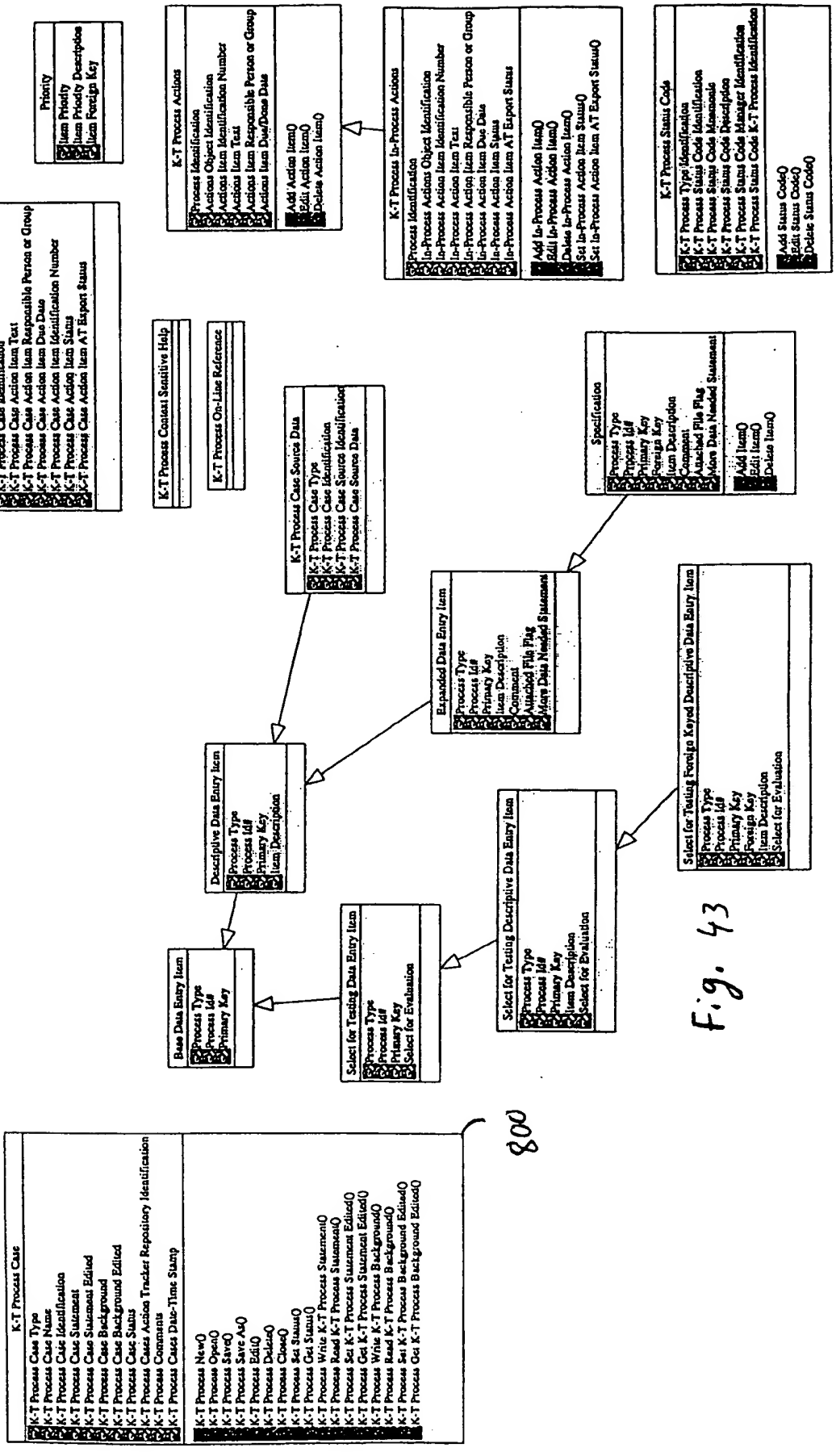

This probably is redundant now
Priority
Item Priority
Item Priority Description
Item Foreign Key
K-T Process In-Process Action Repository
K-T Process Case Type
K-T Process Case Identification
K-T Process Case Action Item Text
K-T Process Case Action Item Responsible Person or Group
K-T Process Case Action Item Due Date
K-T Process Case Action Item Identification Number
K-T Process Case Action Item Status
K-T Process Case Action Item AT Export Status
K-T Process Actions
Process Identification
Actions Object Identification
Actions Item Identification Number
Actions Item Text
Actions Item Responsible Person or Group
Actions Item Due/Done Date
Add Action Item()
Edit Action Item()
Delete Action Item()
K-T Process In-Process Actions
Process Identification
In-Process Actions Object Identification
In-Process Action Item Identification Number
In-Process Action Item Text
In-Process Action Item Responsible Person or Group
In-Process Action Item Due Date
In-Process Action Item Status
In-Process Action Item AT Export Status
Add In-Process Action Item()
Edit In-Process Action Item()
Delete In-Process Action Item()
Set In-Process Action Item Status()
Set In-Process Action Item AT Export Status()
K-T Process Status Code
K-T Process Type Identification
K-T Process Status Code Identification
K-T Process Status Code Mnemonic
K-T Process Status Code Description
K-T Process Status Code Manager Identification
K-T Process Status Code K-T Process Identification
Add Status Code()
Edit Status Code()
Delete Status Code()
K-T Process Contest Sensitive Help
K-T Process On-Line Reference
K-T Process Case Source Data
K-T Process Case Type
K-T Process Case Identification
K-T Process Case Source Identification
K-T Process Case Source Data
Specification
Process Type
Process Id#
Primary Key
Foreign Key
Item Description
Comment
Attached File Flag
More Data Needed Statement
Add Item()
Edit Item()
Delete Item()
Expanded Data Entry Item
Process Type
Process Id#
Primary Key
Item Description
Comment
Attached File Flag
More Data Needed Statement
Descriptive Data Entry Item
Process Type
Process Id#
Primary Key
Item Description
Base Data Entry Item
Process Type
Process Id#
Primary Key
Select for Testing Data Entry Item
Process Type
Process Id#
Primary Key
Select for Evaluation
Select for Testing Descriptive Data Entry Item
Process Type
Process Id#
Primary Key
Item Description
Select for Evaluation
Select for Testing Foreign Keyed Descriptive Data Entry Item
Process Type
Process Id#
Primary Key
Foreign Key
Item Description
Select for Evaluation
K-T Process Case
K-T Process Case Type
K-T Process Case Name
K-T Process Case Identification
K-T Process Case Statement
K-T Process Case Statement Edited
K-T Process Case Background
K-T Process Case Background Edited
K-T Process Case Status
K-T Process Cases Action Tracker Repository Identification
K-T Process Comments
K-T Process Cases Date-Time Stamp
K-T Process New()
K-T Process Open()
K-T Process Save()
K-T Process Save As()
K-T Process Edit()
K-T Process Delete()
K-T Process Close()
K-T Process Set Status()
K-T Process Get Status()
K-T Process Write K-T Process Statement()
K-T Process Read K-T Process Statement()
K-T Process Set K-T Process Statement Edited()
K-T Process Get K-T Process Statement Edited()
K-T Process Write K-T Process Background()
K-T Process Read K-T Process Background()
K-T Process Set K-T Process Background Edited()
K-T Process Get K-T Process Background Edited()
800

Fig. 43

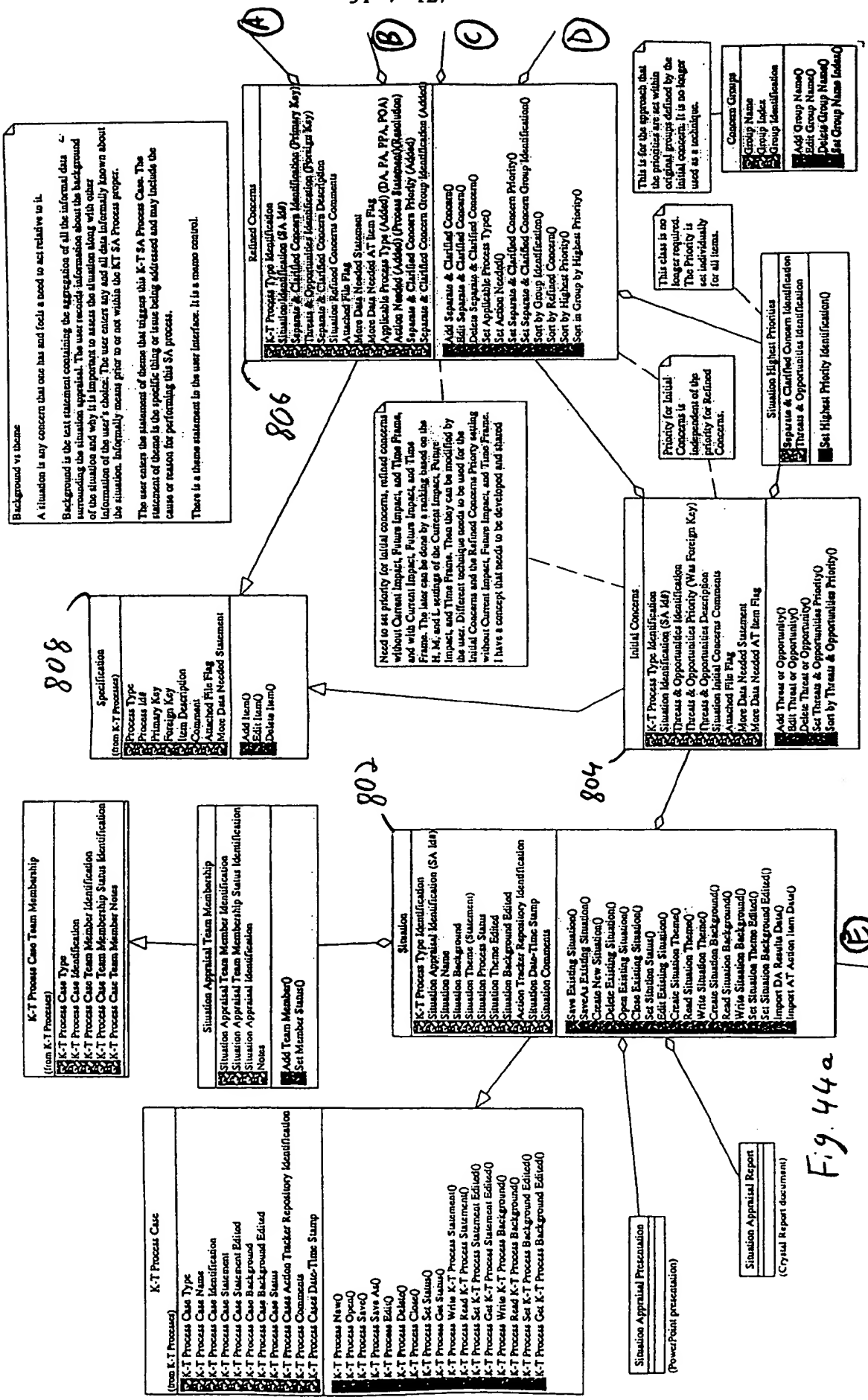

A
B
C
D
E
806
808
802
804
Background vs theme
A situation is any concern that one has and feels a need to act relative to it.
Background is the text statement containing the aggregation of all the informal data surrounding the situation appraisal. The user records information about the background of the situation and why it is important to assess the situation along with other information of the user's choice. The user enters any and all data informally known about the situation. Informally means prior to or not within the KT SA Process proper.
The user enters the statement of theme that triggers this K-T SA Process Case. The statement of theme is the specific thing or issue being addressed and may include the cause or reason for performing this SA process.
There is a theme statement in the user interface. It is a macro control.
Refined Concerns
K-T Process Type Identification
Situation Identification (SA Id#)
Separate & Clarified Concern Identification (Primary Key)
Threats & Opportunities Identification (Foreign Key)
Separate & Clarified Concern Description
Situation Refined Concerns Comments
Attached File Flag
More Data Needed Statement
More Data Needed AT Item Flag
Applicable Process Type (Added) (DA, PA, PPA, POA)
Action Needed (Added) (Process Statement)(Resolution)
Separate & Clarified Concern Priority (Added)
Separate & clarified Concern Group Identification (Added)
Add Separate & Clarified Concern()
Edit Separate & Clarified Concern()
Delete Separate & Clarified Concern()
Set Applicable Process Type()
Set Action Needed()
Set Separate & Clarified Concern Priority()
Set Separate & Clarified Concern Group Identification()
Sort by Group Identification()
Sort by Refined Concern()
Sort by Highest Priority()
Sort in Group by Highest Priority()
This is for the approach that the priorities are set within original groups defined by the initial concern. It is no longer used as a technique.
Concern Groups
Group Name
Group Index
Group Identification
Add Group Name()
Edit Group Name()
Delete Group Name()
Set Group Name Index()
This class is no longer required. The Priority is set individually for all items.
Priority for Initial Concerns is independent of the priority for Refined Concerns.
Situation Highest Priorities
Separate & Clarified Concern Identification
Threats & Opportunities Identification
Set Highest Priority Identification()
Need to set priority for initial concerns, refined concerns without Current Impact, Future Impact, and Time Frame, and with Current Impact, Future Impact, and Time Frame. The latter can be done by a ranking based on the H, M, and L settings of the Current Impact, Future Impact, and Time Frame. Then they can be modified by the user. Different technique needs to be used for the Initial Concerns and the Refined Concerns Priority setting without Current Impact, Future Impact, and Time Frame. I have a concept that needs to be developed and shared
Initial Concerns
K-T Process Type Identification
Situation Identification (SA Id#)
Threats & Opportunities Identification
Threats & Opportunities Priority (Was Foreign Key)
Threats & Opportunities Description
Situation Initial Concerns Comments
Attached File Flag
More Data Needed Statement
More Data Needed AT Item Flag
Add Threat or Opportunity()
Edit Threat or Opportunity()
Delete Threat or Opportunity()
Set Threats & Opportunities Priority()
Sort by Threats & Opportunities Priority()
Specification
(from K-T Processes)
Process Type
Process Id#
Primary Key
Foreign Key
Item Description
Comment
Attached File Flag
More Data Needed Statement
Add Item()
Edit Item()
Delete Item()
K-T Process Case Team Membership
(from K-T Processes)
K-T Process Case Type
K-T Process Case Name
K-T Process Case Identification
K-T Process Case Team Member Identification
K-T Process Case Team Membership Status Identification
K-T Process Case Team Member Notes
Situation Appraisal Team Membership
Situation Appraisal Team Member Identification
Situation Appraisal Team Membership Status Identification
Situation Appraisal Identification
Notes
Add Team Member()
Set Member Status()
Situation
K-T Process Type Identification
Situation Appraisal Identification (SA Id#)
Situation Name
Situation Background
Situation Theme (Statement)
Situation Process Status
Situation Theme Edited
Situation Background Edited
Action Tracker Repository Identification
Situation Date-Time Stamp
Situation Comments
Save Existing Situation()
SaveAs Existing Situation()
Create New Situation()
Delete Existing Situation()
Open Existing Situation()
Close Existing Situation()
Set Situation Status()
Edit Existing Situation()
Create Situation Theme()
Read Situation Theme()
Write Situation Theme()
Create Situation Background()
Read Situation Background()
Write Situation Background()
Set Situation Theme Edited()
Set Situation Background Edited()
Import DA Results Data()
Import AT Action Item Data()
K-T Process Case
(from K-T Processes)
K-T Process Case Type
K-T Process Case Name
K-T Process Case Identification
K-T Process Case Statement
K-T Process Case Statement Edited
K-T Process Case Background
K-T Process Case Background Edited
K-T Process Case Status
K-T Process Cases Action Tracker Repository Identification
K-T Process Case Comments
K-T Process Cases Date-Time Stamp
K-T Process New()
K-T Process Open()
K-T Process Save()
K-T Process Save As()
K-T Process Edit()
K-T Process Delete()
K-T Process Close()
K-T Process Set Status()
K-T Process Get Status()
K-T Process Write K-T Process Statement()
K-T Process Read K-T Process Statement()
K-T Process Set K-T Process Statement Edited()
K-T Process Get K-T Process Statement Edited()
K-T Process Write K-T Process Background()
K-T Process Read K-T Process Background()
K-T Process Set K-T Process Background Edited()
K-T Process Get K-T Process Background Edited()
Situation Appraisal Presentation
(PowerPoint presentation)
Situation Appraisal Report
(Crystal Report document)

Fig. 44a

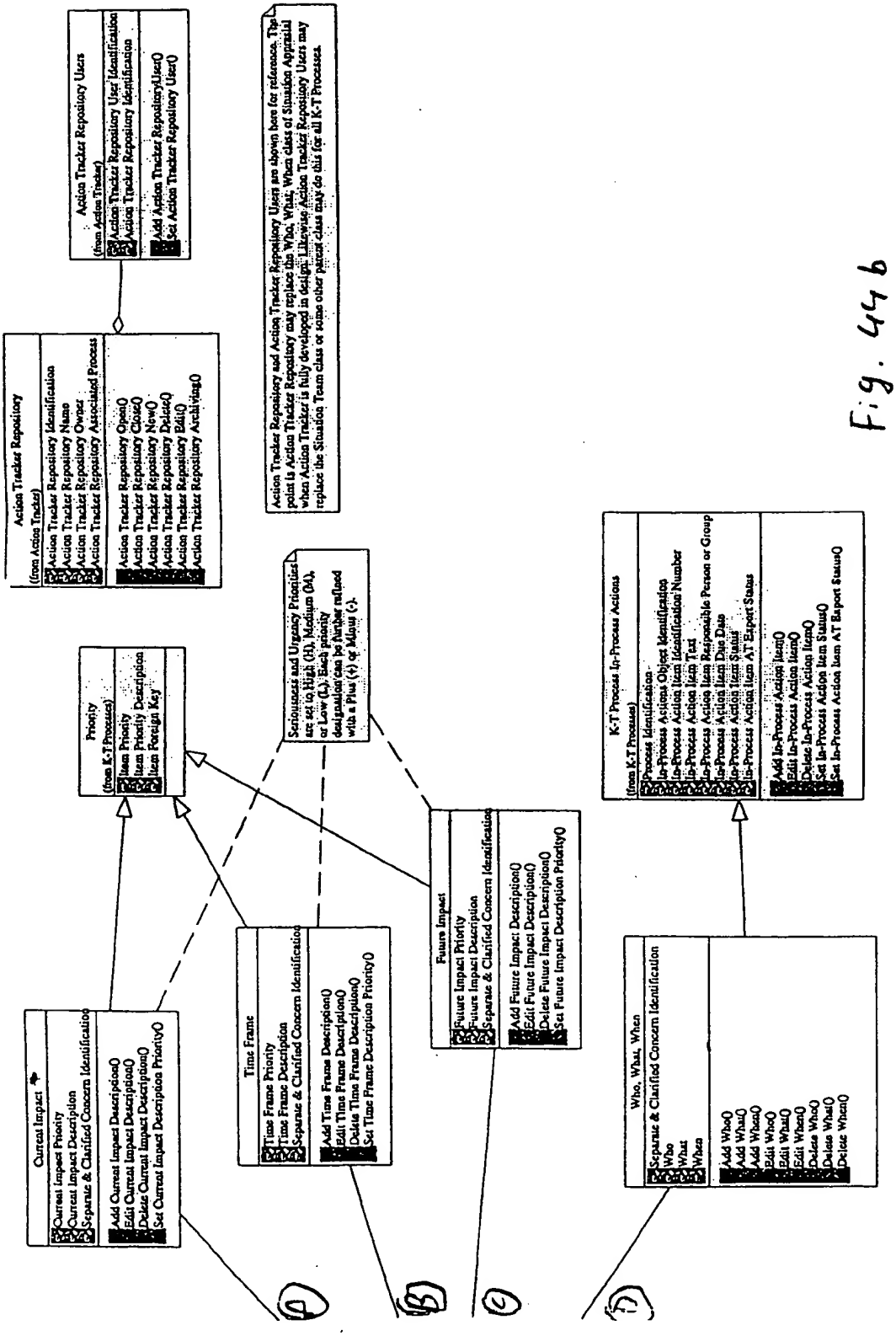

Action Tracker Repository Users
(from Action Tracker)
Action Tracker Repository User Identification
Action Tracker Repository Identification
Add Action Tracker RepositoryUser()
Set Action Tracker Repository User()
Action Tracker Repository
(from Action Tracker)
Action Tracker Repository Identification
Action Tracker Repository Name
Action Tracker Repository Owner
Action Tracker Repository Associated Process
Action Tracker Repository Open()
Action Tracker Repository Close()
Action Tracker Repository New()
Action Tracker Repository Delete()
Action Tracker Repository Edit()
Action Tracker Repository Archives()
Action Tracker Repository and Action Tracker Repository Users are shown here for reference. The point is Action Tracker Repository may replace the Who, What, When class of Situation Appraisal when Action Tracker is fully developed in design; likewise Action Tracker Repository Users may replace the Situation Team class or some other parent class may do this for all K-T Processes.
Priority
(from K-T Processes)
Item Priority
Item Priority Description
Item Foreign Key
Seriousness and Urgency Priorities are set to High (H), Medium (M), or Low (L). Each priority designation can be further refined with a Plus (+) or Minus (-).
K-T Process In-Process Actions
(from K-T Processes)
Process Identification
In-Process Action Object Identification
In-Process Action Item Identification Number
In-Process Action Item Text
In-Process Action Item Responsible Person or Group
In-Process Action Item Due Date
In-Process Action Item Status
In-Process Action Item AT Export Status
Add In-Process Action Item()
Edit In-Process Action Item()
Delete In-Process Action Item()
Set In-Process Action Item Status()
Set In-Process Action Item AT Export Status()
Current Impact
Current Impact Priority
Current Impact Description
Separate & Clarified Concern Identification
Add Current Impact Description()
Edit Current Impact Description()
Delete Current Impact Description()
Set Current Impact Description Priority()
Time Frame
Time Frame Priority
Time Frame Description
Separate & Clarified Concern Identification
Add Time Frame Description()
Edit Time Frame Description()
Delete Time Frame Description()
Set Time Frame Description Priority()
Future Impact
Future Impact Priority
Future Impact Description
Separate & Clarified Concern Identification
Add Future Impact Description()
Edit Future Impact Description()
Delete Future Impact Description()
Set Future Impact Description Priority()
Who, What, When
Separate & Clarified Concern Identification
Who
What
When
Add Who()
Add What()
Add When()
Edit Who()
Edit What()
Edit When()
Delete Who()
Delete What()
Delete When()
a
b
c
d

Fig. 44b

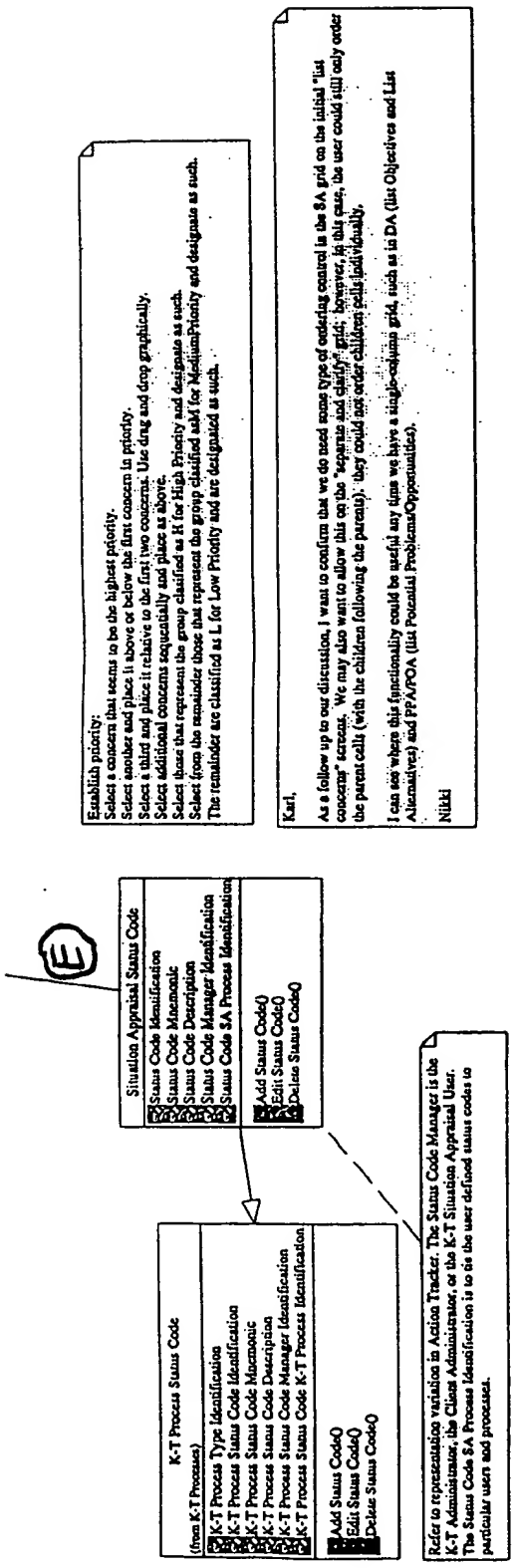

E
Situation Appraisal Status Code
Status Code Identification
Status Code Mnemonic
Status Code Description
Status Code Manager Identification
Status Code SA Process Identification
Add Status Code()
Edit Status Code()
Delete Status Code()
K-T Process Status Code
(from K-T Processes)
K-T Process Type Identification
K-T Process Status Code Identification
K-T Process Status Code Mnemonic
K-T Process Status Code Description
K-T Process Status Code Manager Identification
K-T Process Status Code K-T Process Identification
Add Status Code()
Edit Status Code()
Delete Status Code()
Refer to representation variation in Action Tracker. The Status Code Manager is the K-T Administrator, the Client Administrator, or the K-T Situation Appraisal User. The Status Code SA Process Identification is to tie the user defined status codes to particular users and processes.
Establish priority:
Select a concern that seems to be the highest priority.
Select another and place it above or below the first concern in priority.
Select a third and place it relative to the first two concerns. Use drag and drop graphically.
Select additional concerns sequentially and place as above.
Select those that represent the group classified as H for High Priority and designate as such.
Select from the remainder those that represent the group classified as M for MediumPriority and designate as such.
The remainder are classified as L for Low Priority and are designated as such.
Karl,
As a follow up to our discussion, I want to confirm that we do need some type of ordering control in the SA grid on the initial "list concerns" screens. We may also want to allow this on the "separate and clarify" grid; however, in this case, the user could still only order the parent cells (with the children following the parents); they could not order children cells individually.
I can see where this functionality could be useful any time we have a single-column grid, such as in DA (list Objectives and List Alternatives) and PPA/POA (list Potential Problems/Opportunities).
Nikki

Fig. 44c

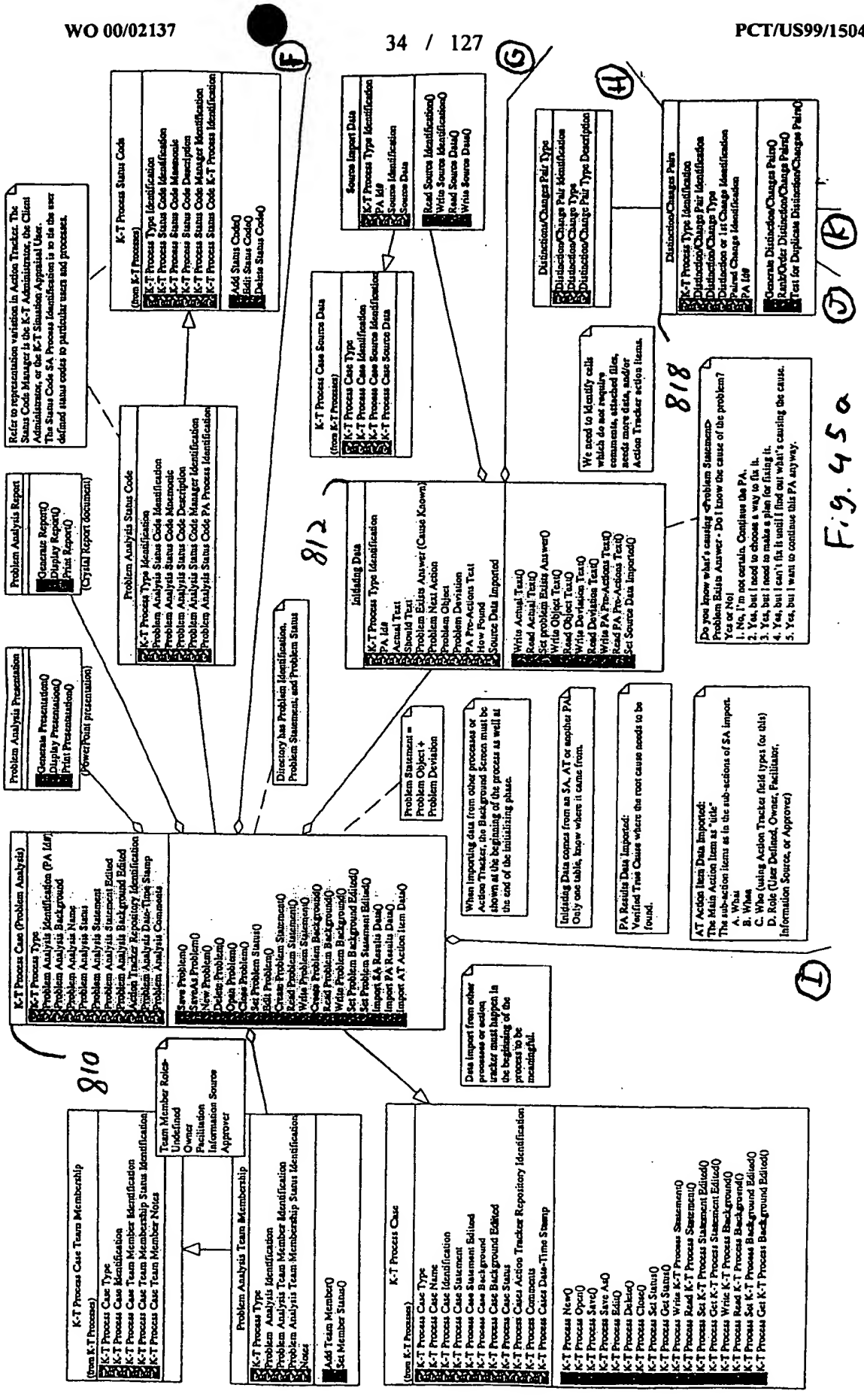
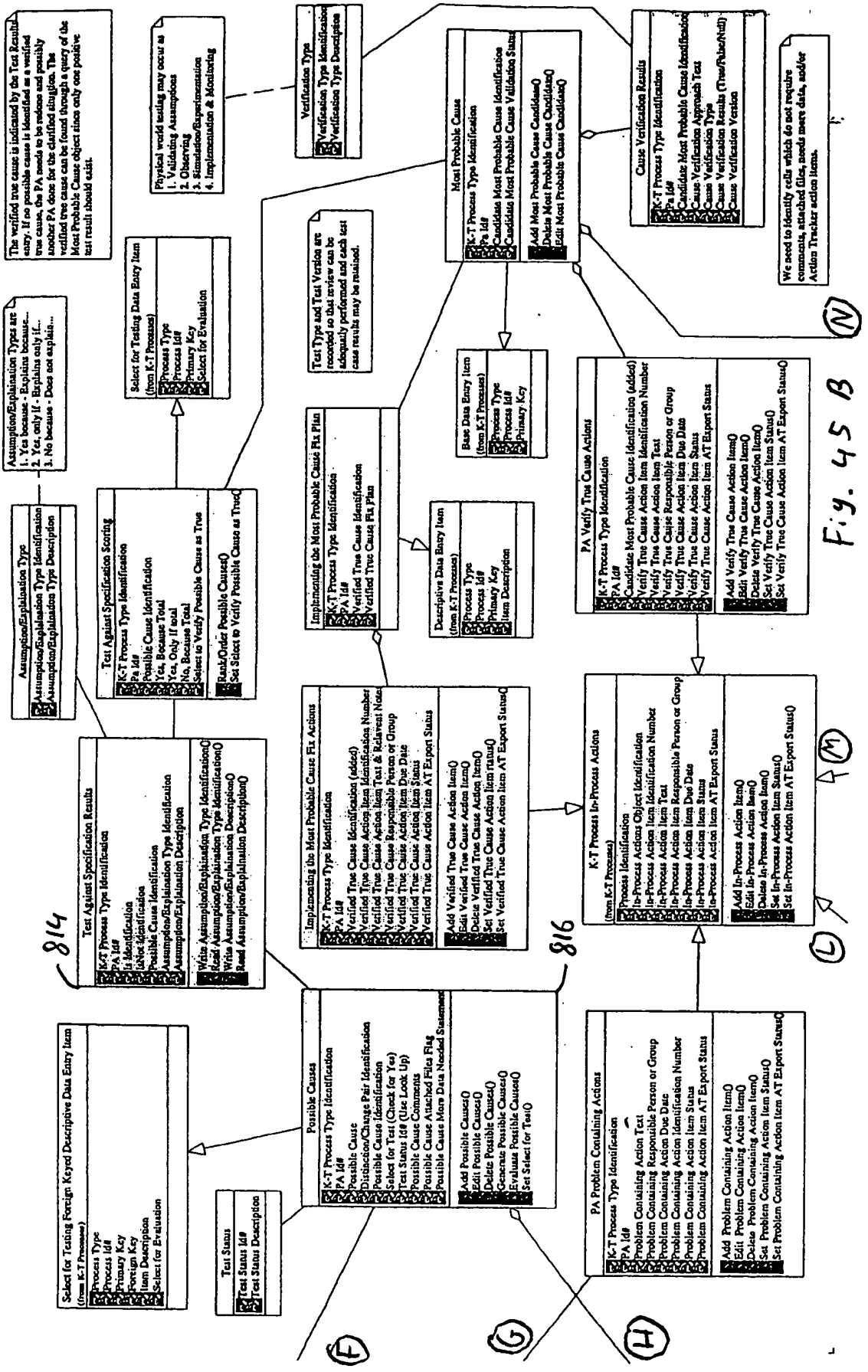

K-T Process Case (Problem Analysis)
K-T Process Type
Problem Analysis Identification (PA Id#)
Problem Analysis Background
Problem Analysis Name
Problem Analysis Status
Problem Analysis Statement
Problem Analysis Statement Edited
Problem Analysis Background Edited
Action Tracker Repository Identification
Problem Analysis Date-Time Stamp
Problem Analysis Comments
Save Problem()
SaveAs Problem()
New Problem()
Delete Problem()
Open Problem()
Close Problem()
Set Problem Status()
Edit Problem()
Create Problem Statement()
Read Problem Statement()
Write Problem Statement()
Create Problem Background()
Read Problem Background()
Write Problem Background()
Set Problem Background Edited()
Set Problem Statement Edited()
Import SA Results Data()
Import PA Results Data()
Import AT Action Item Data()
810
K-T Process Case Team Membership
(from K-T Process)
K-T Process Case Type
K-T Process Case Identification
K-T Process Case Team Member Identification
K-T Process Case Team Membership Status Identification
K-T Process Case Team Member Notes
Team Member Roles
Undefined
Owner
Facilitator
Information Source
Approver
Problem Analysis Team Membership
K-T Process Type
Problem Analysis Identification
Problem Analysis Team Member Identification
Problem Analysis Team Membership Status Identification
Notes
Add Team Member()
Set Member Status()
K-T Process Case
(from K-T Process)
K-T Process Case Type
K-T Process Case Name
K-T Process Case Identification
K-T Process Case Statement
K-T Process Case Statement Edited
K-T Process Case Background
K-T Process Case Background Edited
K-T Process Case Status
K-T Process Cases Actico Tracker Repository Identification
K-T Process Comments
K-T Process Cases Date-Time Stamp
K-T Process New()
K-T Process Open()
K-T Process Save()
K-T Process Save As()
K-T Process Edit()
K-T Process Close()
K-T Process Set Status()
K-T Process Get Status()
K-T Process Write K-T Process Statement()
K-T Process Read K-T Process Statement()
K-T Process Set K-T Process Statement Edited()
K-T Process Get K-T Process Statement Edited()
K-T Process Write K-T Process Background()
K-T Process Read K-T Process Background()
K-T Process Set K-T Process Background Edited()
K-T Process Get K-T Process Background Edited()
Problem Analysis Report
Generate Report()
Display Report()
Print Report()
(Crystal Report document)
Problem Analysis Presentation
Generate Presentation()
Display Presentation()
Print Presentation()
(PowerPoint presentation)
Refer to representation variation in Action Tracker. The Status Code Manager is the K-T Administrator, the Client Administrator, or the K-T Situation Appraisal User. The Status Code SA Process Identification is to tie the user defined status codes to particular users and processes.
K-T Process Status Code
(from K-T Process)
K-T Process Type Identification
K-T Process Status Code Identification
K-T Process Status Code Mnemonic
K-T Process Status Code Description
K-T Process Status Code Manager Identification
K-T Process Status Code K-T Process Identification
Add Status Code()
Edit Status Code()
Delete Status Code()
Problem Analysis Status Code
K-T Process Type Identification
Problem Analysis Status Code Identification
Problem Analysis Status Code Mnemonic
Problem Analysis Status Code Description
Problem Analysis Status Code Manager Identification
Problem Analysis Status Code PA Process Identification
Directory has Problem Identification, Problem Statement, and Problem Status
812
Initiating Data
K-T Process Type Identification
PA Id#
Actual Text
Should Text
Problem Exists Answer (Cause Known)
Problem Next Action
Problem Object
Problem Deviation
PA Pre-Actions Text
How Found
Source Data Imported
Write Actual Text()
Read Actual Text()
Set problem Exists Answer()
Write Object Text()
Read Object Text()
Write Deviation Text()
Read Deviation Text()
Write PA Pre-Actions Text()
Read PA Pre-Actions Text()
Set Source Data Imported()
K-T Process Case Source Data
(from K-T Process)
K-T Process Case Type
K-T Process Case Identification
K-T Process Case Source Identification
K-T Process Case Source Data
Source Import Data
K-T Process Type Identification
PA Id#
Source Identification
Source Data
Read Source Identification()
Write Source Identification()
Read Source Data()
Write Source Data()
Distinction/Change Pair Type
Distinction/Change Pair Identification
Distinction/Change Type
Distinction/Change Pair Type Description
Distinction/Change Pairs
K-T Process Type Identification
Distinction/Change Pair Identification
Distinction/Change Type
Distinction or 1st Change Identification
Paired Change Identification
PA Id#
Generate Distinction/Change Pairs()
Rank/Order Distinction/Change Pairs()
Test for Duplicate Distinction/Change Pairs()
818
We need to identify cells which do not require comments, attached files, needs more data, and/or Action Tracker action items.
Do you know what's causing <Problem Statement>
Problem Exists Answer - Do I know the cause of the problem?
Yes or No!
1. No, I'm not certain. Continue the PA.
2. Yes, but I need to choose a way to fix it.
3. Yes, but I need to make a plan for fixing it.
4. Yes, but I can't fix it until I find out what's causing the cause.
5. Yes, but I want to continue this PA anyway.
Problem Statement = Problem Object + Problem Deviation
When importing data from other processes or Action Tracker, the Background Screen must be shown at the beginning of the process as well as the end of the Initializing phase.
Initiating Data comes from an SA, AT or another PA. Only one table, know where it came from.
PA Results Data Imported:
Verified True Causes where the root cause needs to be found.
AT Action Item Data Imported:
The Main Action Item as "title"
The sub-action items as in the sub-actions of SA import.
A. What
B. When
C. Who (using Action Tracker field types for this)
D. Role (User Defined, Owner, Facilitator, Information Source, or Approver)
Data import from other processes or action tracker must happen in the beginning of the process to be meaningful.
F
G
H
I
J
K
L

Fig. 45a


The verified true cause is indicated by the Test Result entry. If no possible cause is identified as a verified true cause, the PA needs to be redone and possibly another PA done for the clarified singleton. The verified true cause can be found through a query of the Most Probable Cause object since only one positive test result should exist.
Physical world testing may occur as
1. Validating Assumptions
2. Observing
3. Simulation/Experimentation
4. Implementation & Monitoring
Verification Type
Verification Type Identification
Verification Type Description
Most Probable Cause
K-T Process Type Identification
Pa Id#
Candidate Most Probable Cause Identification
Candidate Most Probable Cause Validation Status
Add Most Probable Cause Candidate()
Delete Most Probable Cause Candidate()
Edit Most Probable Cause Candidate()
Cause Verification Results
K-T Process Type Identification
Pa Id#
Candidate Most Probable Cause Identification
Cause Verification Approach Text
Cause Verification Type
Cause Verification Results (True/False/Null)
Cause Verification Version
We need to identify cells which do not require comments, attached files, needs more data, and/or Action Tracker action items.
N
Assumption/Explanation Types are
1. Yes because - Explains because...
2. Yes, only if - Explains only if...
3. No because - Does not explain...
Assumption/Explanation Type
Assumption/Explanation Type Identification
Assumption/Explanation Type Description
Select for Testing Data Entry Item
(from K-T Processes)
Process Type
Process Id#
Primary Key
Select for Evaluation
Test Against Specification Scoring
K-T Process Type Identification
Pa Id#
Possible Cause Identification
Yes, Because Total
Yes, Only If total
No, Because Total
Select to Verify Possible Cause as True
Rank/Order Possible Causes()
Set Select to Verify Possible Cause as True()
Test Type and Test Version are recorded so that review can be adequately performed and each test case results may be retained.
Base Data Entry Item
(from K-T Processes)
Process Type
Process Id#
Primary Key
Implementing the Most Probable Cause Fix Plan
K-T Process Type Identification
Pa Id#
Verified True Cause Identification
Verified True Cause Fix Plan
Descriptive Data Entry Item
(from K-T Processes)
Process Type
Process Id#
Primary Key
Item Description
PA Verify True Cause Actions
K-T Process Type Identification
PA Id#
Candidate Most Probable Cause Identification (added)
Verify True Cause Action Item Identification Number
Verify True Cause Action Item Text
Verify True Cause Responsible Person or Group
Verify True Cause Action Item Due Date
Verify True Cause Action Item Status
Verify True Cause Action Item AT Export Status
Add Verify True Cause Action Item()
Edit Verify True Cause Action Item()
Delete Verify True Cause Action Item()
Set Verify True Cause Action Item Status()
Set Verify True Cause Action Item AT Export Status()
Fig. 45 B
Test Against Specification Results
K-T Process Type Identification
PA Id#
Is Identification
isNot Identification
Possible Cause Identification
Assumption/Explanation Type Identification
Assumption/Explanation Description
Write Assumption/Explanation Type Identification()
Read Assumption/Explanation Type Identification()
Write Assumption/Explanation Description()
Read Assumption/Explanation Description()
814
Implementing the Most Probable Cause Fix Actions
K-T Process Type Identification
PA Id#
Verified True Cause Identification (added)
Verified True Cause Action Item Identification Number
Verified True Cause Action Item Text & Relevant Notes
Verified True Cause Responsible Person or Group
Verified True Cause Action Item Due Date
Verified True Cause Action Item Status
Verified True Cause Action Item AT Export Status
Add Verified True Cause Action Item()
Edit Verified True Cause Action Item()
Delete Verified True Cause Action Item()
Set Verified True Cause Action item status()
Set Verified True Cause Action item AT Export Status()
816
K-T Process In-Process Actions
(from K-T Processes)
Process Identification
In-Process Actions Object Identification
In-Process Action Item Identification Number
In-Process Action Item Text
In-Process Action Item Responsible Person or Group
In-Process Action Item Due Date
In-Process Action Item Status
In-Process Action Item AT Export Status
Add In-Process Action Item()
Edit In-Process Action Item()
Delete In-Process Action Item()
Set In-Process Action Item Status()
Set In-Process Action Item AT Export Status()
L
M
Select for Testing Foreign Keyed Descriptive Data Entry Item
(from K-T Processes)
Process Type
Process Id#
Primary Key
Foreign Key
Item Description
Select for Evaluation
Possible Causes
K-T Process Type Identification
PA Id#
Possible Cause
Distinction/Change Pair Identification
Possible Cause Identification
Select for Test (Check for Yes)
Test Status Id# (Use Look Up)
Possible Cause Comments
Possible Cause Attached Files Flag
Possible Cause More Data Needed Statement
Add Possible Cause()
Edit Possible Cause()
Delete Possible Cause()
Generate Possible Cause()
Evaluate Possible Cause()
Set Select for Test()
Test Status
Test Status Id#
Test Status Description
PA Problem Containing Actions
K-T Process Type Identification
PA Id#
Problem Containing Action Text
Problem Containing Responsible Person or Group
Problem Containing Action Due Date
Problem Containing Action Identification Number
Problem Containing Action Item Status
Problem Containing Action Item AT Export Status
Add Problem Containing Action Item()
Edit Problem Containing Action Item()
Delete Problem Containing Action Item()
Set Problem Containing Action Item Status()
Set Problem Containing Action Item AT Export Status()
F
G
H

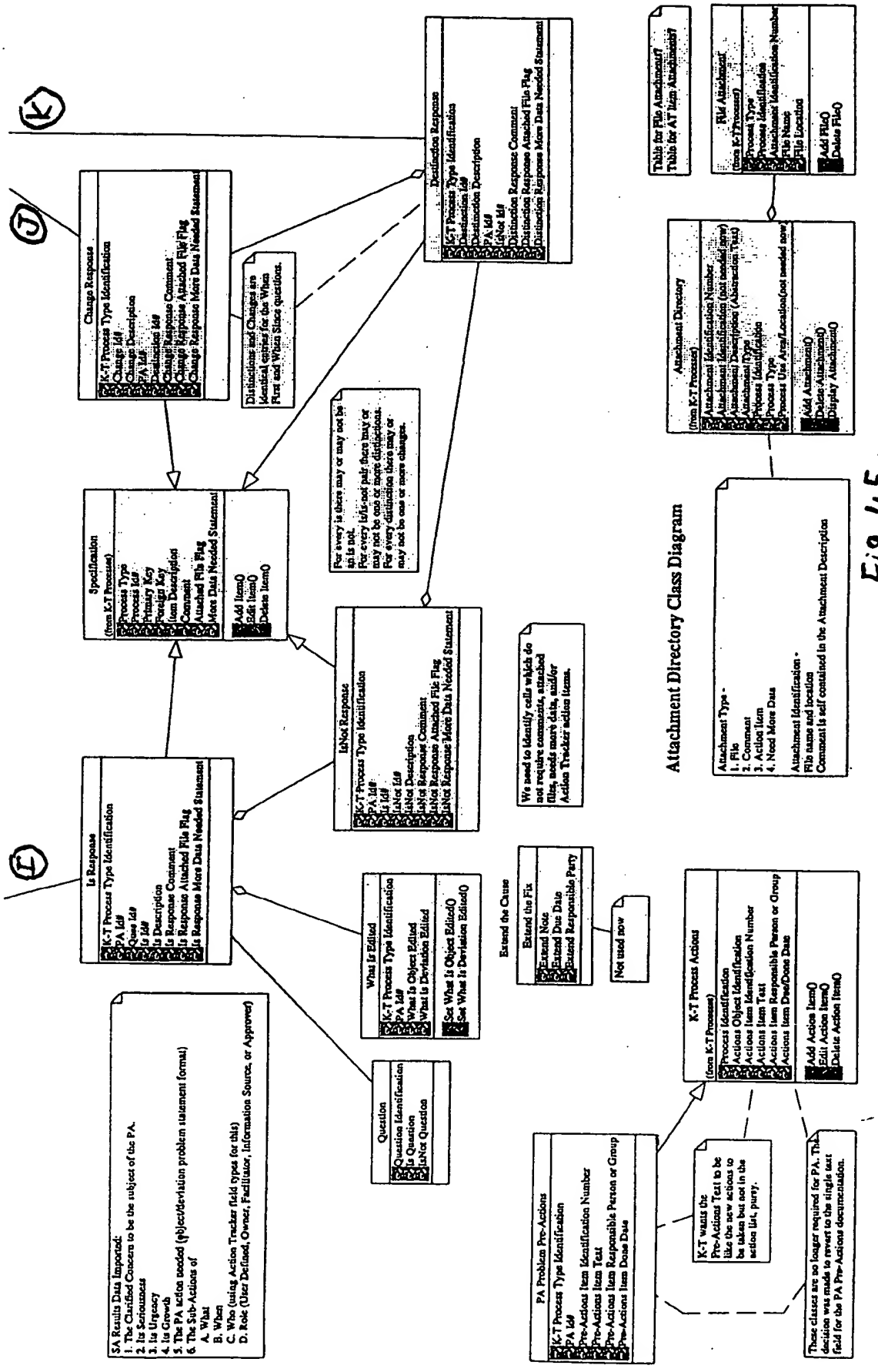

Attachment Directory Class Diagram
Change Response
K-T Process Type Identification
Change Id#
Change Description
PA Id#
Distinction Id#
Change Response Comment
Change Response Attached File Flag
Change Response More Data Needed Statement
Distinction Response
K-T Process Type Identification
Distinction Id#
Distinction Description
PA Id#
isNot Id#
Distinction Response Comment
Distinction Response Attached File Flag
Distinction Response More Data Needed Statement
Distinctions and Changes are identical entries for the When First and When Since questions.
For every is there may or may not be an is not.
For every isNot pair there may or may not be one or more distinctions.
For every distinction there may or may not be one or more changes.
Specification
(from K-T Processes)
Process Type
Process Id#
Primary Key
Foreign Key
Item Description
Comment
Attached File Flag
More Data Needed Statement
Add Item()
Edit Item()
Delete Item()
Is Response
K-T Process Type Identification
PA Id#
Que Id#
Is Id#
Is Description
Is Response Comment
Is Response Attached File Flag
Is Response More Data Needed Statement
isNot Response
K-T Process Type Identification
PA Id#
Is Id#
isNot Id#
isNot Description
isNot Response Comment
isNot Response Attached File Flag
isNot Response More Data Needed Statement
We need to identify cells which do not require comments, attached files, needs more data, and/or Action Tracker action items.
What Is Edited
K-T Process Type Identification
PA Id#
What is Object Edited
What is Deviation Edited
Set What is Object Edited()
Set What is Deviation Edited()
Extend the Case
Extend the Fix
Extend Note
Extend Due Date
Extend Responsible Party
Not used now
Question
Question Identification
Is Question
isNot Question
5A Results Data Imported:
1. The Clarified Concern to be the subject of the PA.
2. Its Seriousness
3. Its Urgency
4. Its Growth
5. The PA action needed (object/deviation problem statement format)
6. The Sub-Actions of
A. What
B. When
C. Who (using Action Tracker field types for this)
D. Role (User Defined, Owner, Facilitator, Information Source, or Approved)
K-T Process Actions
(from K-T Processes)
Process Identification
Actions Object Identification
Actions Item Identification Number
Actions Item Text
Actions Item Responsible Person or Group
Actions Item Due/Done Date
Add Action Item()
Edit Action Item()
Delete Action Item()
PA Problem Pre-Actions
K-T Process Type Identification
PA Id#
Pre-Actions Item Identification Number
Pre-Actions Item Text
Pre-Actions Item Responsible Person or Group
Pre-Actions Item Done Date
K-T wants the Pre-Actions Text to be like the new actions to be taken but not in the action list, purty.
These classes are no longer required for PA. The decision was made to revert to the single text field for the PA Pre-Actions documentation.
Attachment Directory
(from K-T Processes)
Attachment Identification Number
Attachment Identification (not needed now)
Attachment(s) Description (Abstraction Text)
Attachment(s) Type
Process Identification
Process Type
Process Use Area/Location(not needed now)
Add Attachment()
Delete Attachment()
Display Attachment()
Attachment Type -
1. File
2. Comment
3. Action Item
4. Need More Data
Attachment Identification -
File name and location
Comment is self contained in the Attachment Description
Table for File Attachment?
Table for AT Item Attachment?
File Attachment
(from K-T Processes)
Process Type
Process Identification
Attachment Identification Number
File Name
File Location
Add File()
Delete File()

Fig. 45c

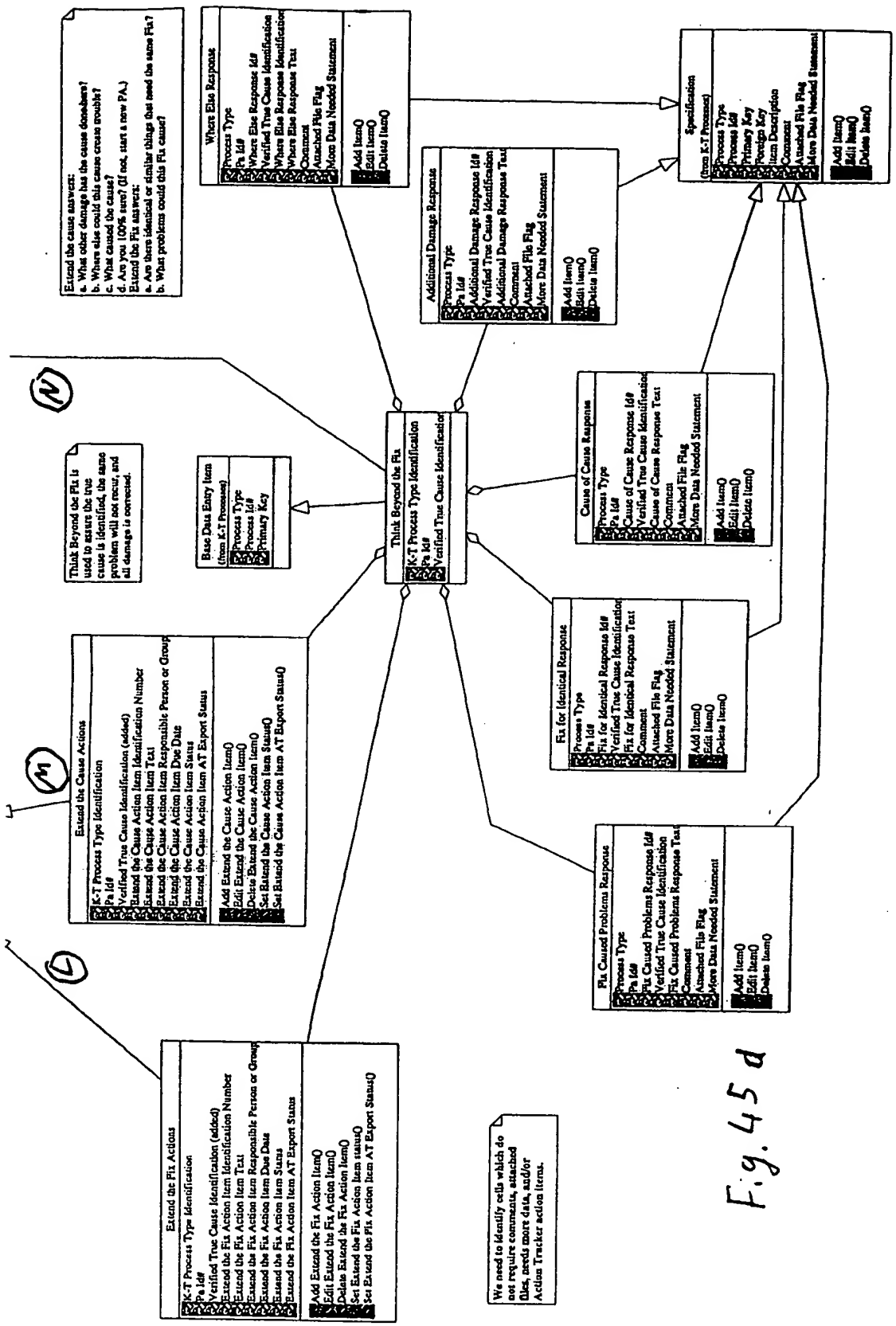

Extend the cause answers:
a. Was other damage has the cause donedone?
b. Where else could this cause create trouble?
c. What caused the cause?
d. Are you 100% sure? (If not, start a new PA.)
Extend the Fix answers:
a. Are there identical or similar things that need the same Fix?
b. What problems could this Fix cause?
Where Else Response
Process Type
Pa Id#
Where Else Response Id#
Verified True Cause Identification
Where Else Response Identification
Where Else Response Text
Comment
Attached File Flag
More Data Needed Statement
Add Item()
Edit Item()
Delete Item()
Additional Damage Response
Process Type
Pa Id#
Additional Damage Response Id#
Verified True Cause Identification
Additional Damage Response Text
Comment
Attached File Flag
More Data Needed Statement
Add Item()
Edit Item()
Delete Item()
Specification
(from K-T Processes)
Process Type
Process Id#
Primary Key
Foreign Key
Item Description
Comment
Attached File Flag
More Data Needed Statement
Add Item()
Edit Item()
Delete Item()
Think Beyond the Fix is used to assure the true cause is identified, the same problem will not recur, and all damage is corrected.
Base Data Entry Item
(from K-T Processes)
Process Type
Process Id#
Primary Key
Think Beyond the Fix
K-T Process Type Identification
Pa Id#
Verified True Cause Identification
Cause of Cause Response
Process Type
Pa Id#
Cause of Cause Response Id#
Verified True Cause Identification
Cause of Cause Response Text
Comment
Attached File Flag
More Data Needed Statement
Add Item()
Edit Item()
Delete Item()
Extend the Cause Actions
K-T Process Type Identification
Pa Id#
Verified True Cause Identification (added)
Extend the Cause Action Item Identification Number
Extend the Cause Action Item Text
Extend the Cause Action Item Responsible Person or Group
Extend the Cause Action Item Due Date
Extend the Cause Action Item Status
Extend the Cause Action Item AT Export Status
Add Extend the Cause Action Item()
Edit Extend the Cause Action Item()
Delete Extend the Cause Action Item()
Set Extend the Cause Action Item Status()
Set Extend the Cause Action Item AT Export Status()
Fix for Identical Response
Process Type
Pa Id#
Fix for Identical Response Id#
Verified True Cause Identification
Fix for Identical Response Text
Comment
Attached File Flag
More Data Needed Statement
Add Item()
Edit Item()
Delete Item()
Fix Caused Problems Response
Process Type
Pa Id#
Fix Caused Problems Response Id#
Verified True Cause Identification
Fix Caused Problems Response Text
Comment
Attached File Flag
More Data Needed Statement
Add Item()
Edit Item()
Delete Item()
Extend the Fix Actions
K-T Process Type Identification
Pa Id#
Verified True Cause Identification (added)
Extend the Fix Action Item Identification Number
Extend the Fix Action Item Text
Extend the Fix Action Item Responsible Person or Group
Extend the Fix Action Item Due Date
Extend the Fix Action Item Status
Extend the Fix Action Item AT Export Status
Add Extend the Fix Action Item()
Edit Extend the Fix Action Item()
Delete Extend the Fix Action Item()
Set Extend the Fix Action Item status()
Set Extend the Fix Action Item AT Export Status()
We need to identify cells which do not require comments, attached files, needs more data, and/or Action Tracker action items.
N
M
L

Fig. 45 d

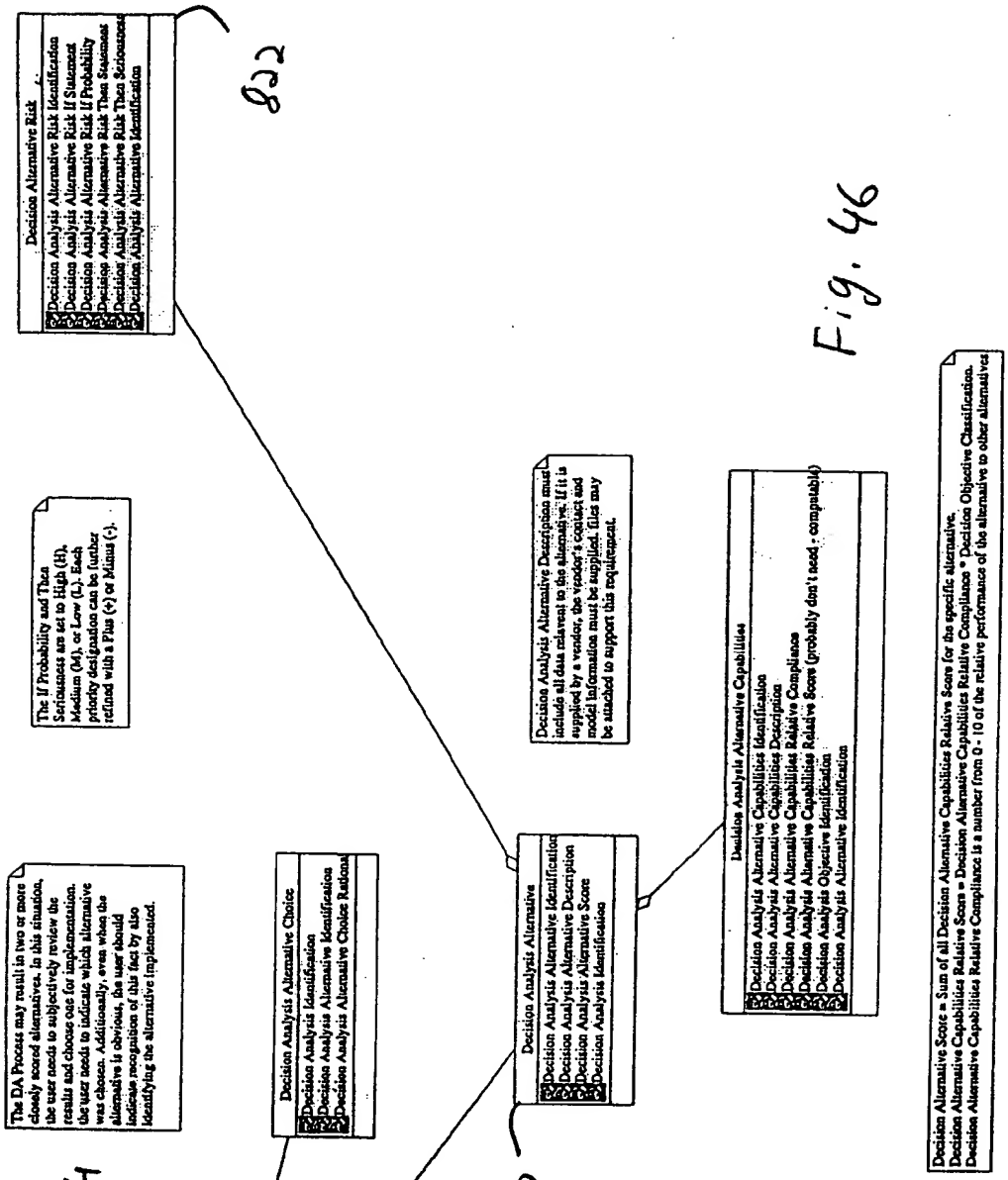

Decision Alternative Risk
Decision Analysis Alternative Risk Identification
Decision Analysis Alternative Risk If Statement
Decision Analysis Alternative Risk If Probability
Decision Analysis Alternative Risk Then Seriousness
Decision Analysis Alternative Identification
822
The If Probability and Then Seriousness are set to High (H), Medium (M), or Low (L). Each priority designation can be further refined with a Plus (+) or Minus (-).
Decision Analysis Alternative Description must include all data relevant to the alternative. If it is supplied by a vendor, the vendor's support and model information must be supplied. files may be attached to support this requirement.
Decision Analysis Alternative Capabilities
Decision Analysis Alternative Capabilities Identification
Decision Analysis Alternative Capabilities Description
Decision Analysis Alternative Capabilities Relative Compliance
Decision Analysis Alternative Capabilities Relative Score (probably don't need - computable)
Decision Analysis Objective Identification
Decision Analysis Alternative Identification
Decision Alternative Score = Sum of all Decision Alternative Capabilities Relative Score for the specific alternative.
Decision Alternative Capabilities Relative Score = Decision Alternative Capabilities Relative Compliance * Decision Objective Classification.
Decision Alternative Capabilities Relative Compliance is a number from 0 - 10 of the relative performance of the alternative to other alternatives
The DA Process may result in two or more closely scored alternatives. In this situation, the user needs to subjectively review the results and choose one for implementation. the user needs to indicate which alternative was chosen. Additionally, even when the alternative is obvious, the user should indicate recognition of this fact by also identifying the alternative implemented.
Decision Analysis Alternative Choice
Decision Analysis Identification
Decision Analysis Alternative Identification
Decision Analysis Alternative Choice Rationale
Decision Analysis Alternative
Decision Analysis Alternative Identification
Decision Analysis Alternative Description
Decision Analysis Alternative Score
Decision Analysis Identification
820
K-T Process Case (Decision Analysis)
K-T Process Case Type
Decision Analysis Identification
Decision Analysis Name
Decision Analysis Background
Decision Analysis Background Edited
Decision Analysis Statement
Decision Analysis Statement Edited
Decision Analysis Status
Decision Analysis Action Tracker Repository Identification
Decision Analysis Comments
Decision Analysis Date-Time Stamp
824
Decision Analysis Objectives
Decision Analysis Objective Identification
Decision Analysis Objective Description
Decision Analysis Objective Measures
Decision Analysis Objective Mandatory
Decision Analysis Objective Set Limit
Decision Analysis Objective Realistic
Decision Analysis Objective Weight
Decision Analysis Identification
818
Decision Objective Classification may be either "M" or a number between 1 & 10. M = Must. A number means a Want of relative importance, 10 being most important. It is possible to use DA without classifying classifying objectives or weighting the Wants.

Fig. 46

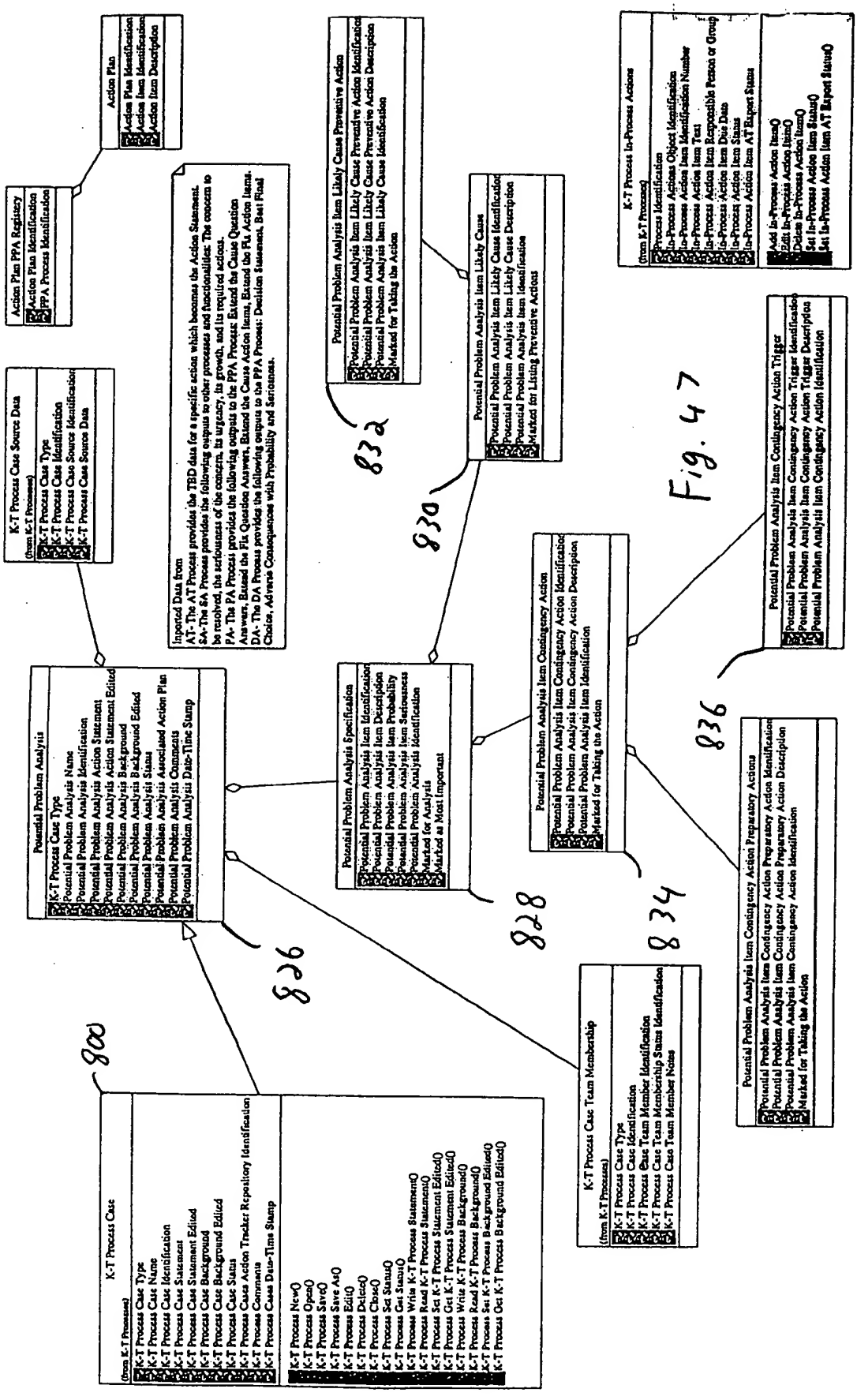

Action Plan
Action Plan Identification
Action Item Identification
Action Item Description
Action Plan PPA Registery
Action Plan Identification
PPPA Process Identification
K-T Process Case Source Data
(from K-T Processes)
K-T Process Case Type
K-T Process Case Identification
K-T Process Case Source Identification
K-T Process Case Source Data
Imported Data from
AT- The AT Process provides the TBD data for a specific action which becomes the Action Statement.
SA-The SA Process provides the following outputs to other processes and functionalities: The concern to be resolved, the seriousness of the concern, its urgency, its growth, and its required actions.
PA- The PA Process provides the following outputs to the PPA Process: Extend the Cause Question Answers, Extend the Fix Question Answers, Extend the Cause Action Items, Extend the Fix Action Items.
DA- The DA Process provides the following outputs to the PPA Process: Decision Statement, Best Final Choice, Adverse Consequences with Probability and Seriousness.
Potential Problem Analysis
K-T Process Case Type
Potential Problem Analysis Name
Potential Problem Analysis Identification
Potential Problem Analysis Action Statement
Potential Problem Analysis Action Statement Edited
Potential Problem Analysis Background
Potential Problem Analysis Background Edited
Potential Problem Analysis Status
Potential Problem Analysis Associated Action Plan
Potential Problem Analysis Comments
Potential Problem Analysis Date-Time Stamp
Potential Problem Analysis Specification
Potential Problem Analysis Item Identification
Potential Problem Analysis Item Description
Potential Problem Analysis Item Probability
Potential Problem Analysis Item Seriousness
Potential Problem Analysis Identification
Marked for Analysis
Marked as Most Important
Potential Problem Analysis Item Likely Cause
Potential Problem Analysis Item Likely Cause Identification
Potential Problem Analysis Item Likely Cause Description
Potential Problem Analysis Item Identification
Marked for Listing Preventive Actions
Potential Problem Analysis Item Likely Cause Preventive Action
Potential Problem Analysis Item Likely Cause Preventive Action Identification
Potential Problem Analysis Item Likely Cause Preventive Action Description
Potential Problem Analysis Item Likely Cause Identification
Marked for Taking the Action
Potential Problem Analysis Item Contingency Action
Potential Problem Analysis Item Contingency Action Identification
Potential Problem Analysis Item Contingency Action Description
Potential Problem Analysis Item Identification
Marked for Taking the Action
Potential Problem Analysis Item Contingency Action Trigger
Potential Problem Analysis Item Contingency Action Trigger Identification
Potential Problem Analysis Item Contingency Action Trigger Description
Potential Problem Analysis Item Contingency Action Identification
Potential Problem Analysis Item Contingency Action Preparatory Actions
Potential Problem Analysis Item Contingency Action Preparatory Action Identification
Potential Problem Analysis Item Contingency Action Preparatory Action Description
Potential Problem Analysis Item Contingency Action Identification
Marked for Taking the Action
K-T Process Case Team Membership
(from K-T Processes)
K-T Process Case Type
K-T Process Case Identification
K-T Process Case Team Member Identification
K-T Process Case Team Membership Status Identification
K-T Process Case Team Member Notes
K-T Process In-Process Actions
(from K-T Processes)
Process Identification
In-Process Action Object Identification
In-Process Action Item Identification Number
In-Process Action Item Text
In-Process Action Item Responsible Person or Group
In-Process Action Item Due Date
In-Process Action Item Status
In-Process Action Item AT Report Status
Add In-Process Action Item()
Edit In-Process Action Item()
Delete In-Process Action Item()
Set In-Process Action Item Status()
Set In-Process Action Item AT Report Status()
K-T Process Case
(from K-T Processes)
K-T Process Case Type
K-T Process Case Name
K-T Process Case Identification
K-T Process Case Statement
K-T Process Case Statement Edited
K-T Process Case Background
K-T Process Case Background Edited
K-T Process Case Status
K-T Process Cases Action Tracker Repository Identification
K-T Process Comments
K-T Process Cases Date-Time Stamp
K-T Process New()
K-T Process Open()
K-T Process Save()
K-T Process Save As()
K-T Process Edit()
K-T Process Delete()
K-T Process Close()
K-T Process Set Status()
K-T Process Get Status()
K-T Process Write K-T Process Statement()
K-T Process Read K-T Process Statement()
K-T Process Set K-T Process Statement Edited()
K-T Process Get K-T Process Statement Edited()
K-T Process Write K-T Process Background()
K-T Process Read K-T Process Background()
K-T Process Set K-T Process Background Edited()
K-T Process Get K-T Process Background Edited()
900
826
828
830
832
834
836

Fig. 47

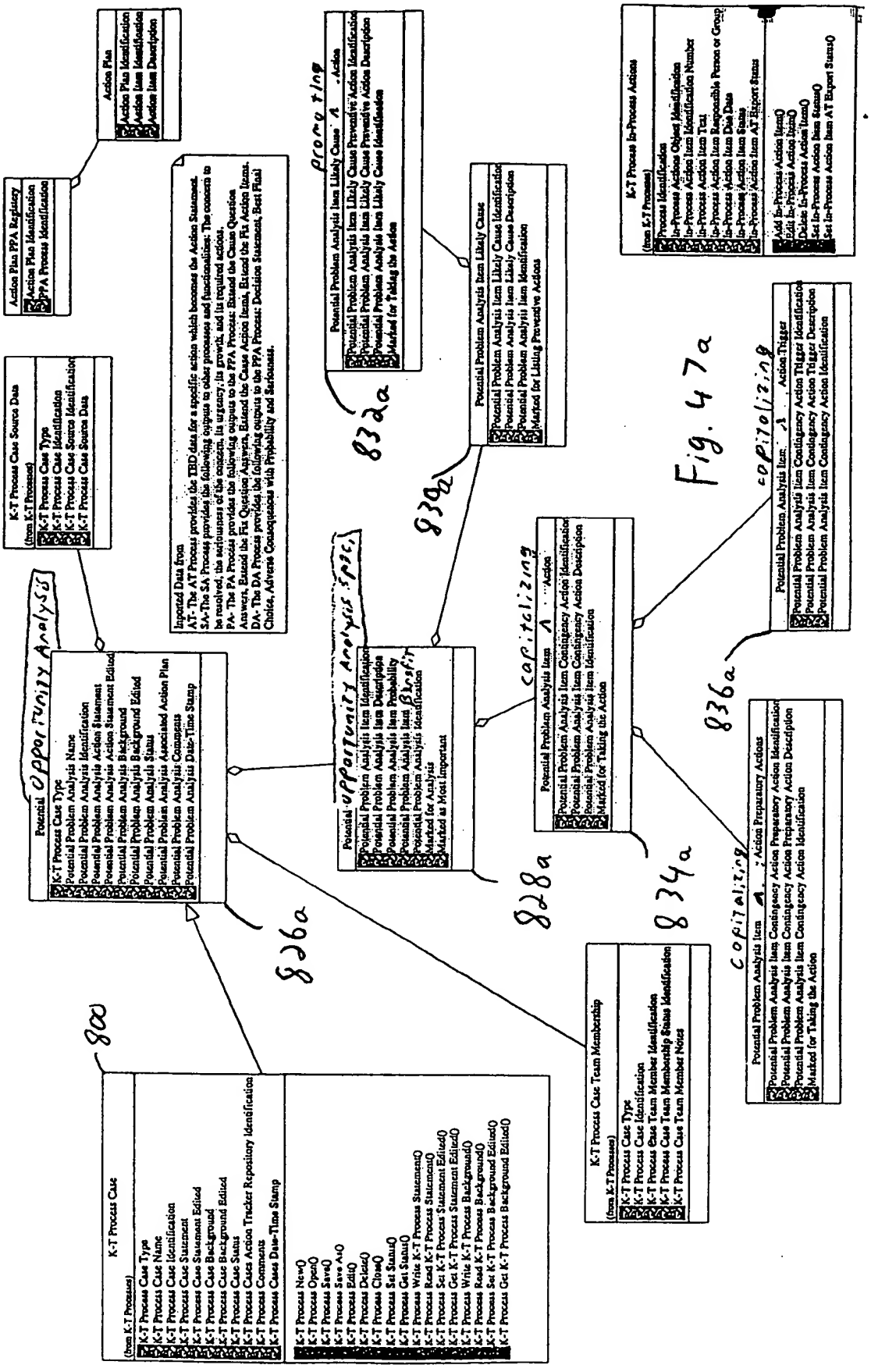


Fig. 47a
836a
838a
839a
828a
834a
836a
840
Potential Opportunity Analysis
Potential Opportunity Analysis Item
Potential Problem Analysis Item
Potential Problem Analysis Item Likely Cause
Potential Problem Analysis Item Likely Cause Identification
Potential Problem Analysis Item Likely Cause Description
Potential Problem Analysis Item Identification
Marked for Listing Preventive Actions
Potential Problem Analysis Item Likely Cause Preventive Action Identification
Potential Problem Analysis Item Likely Cause Preventive Action Description
Potential Problem Analysis Item Likely Cause Identification
Marked for Taking the Action
Potential Problem Analysis Item Contingency Action Identification
Potential Problem Analysis Item Contingency Action Description
Potential Problem Analysis Item Identification
Marked for Taking the Action
Potential Problem Analysis Item Contingency Action Preparatory Action Identification
Potential Problem Analysis Item Contingency Action Preparatory Action Description
Potential Problem Analysis Item Contingency Action Identification
Marked for Taking the Action
Potential Problem Analysis Item Contingency Action Trigger Identification
Potential Problem Analysis Item Contingency Action Trigger Description
Potential Problem Analysis Item Contingency Action Identification
K-T Process Case
K-T Process Case Source Data
Action Plan
Action Plan PPA Registery
Imported Data from
K-T Process Case Team Membership
K-T Process In-Process Actions

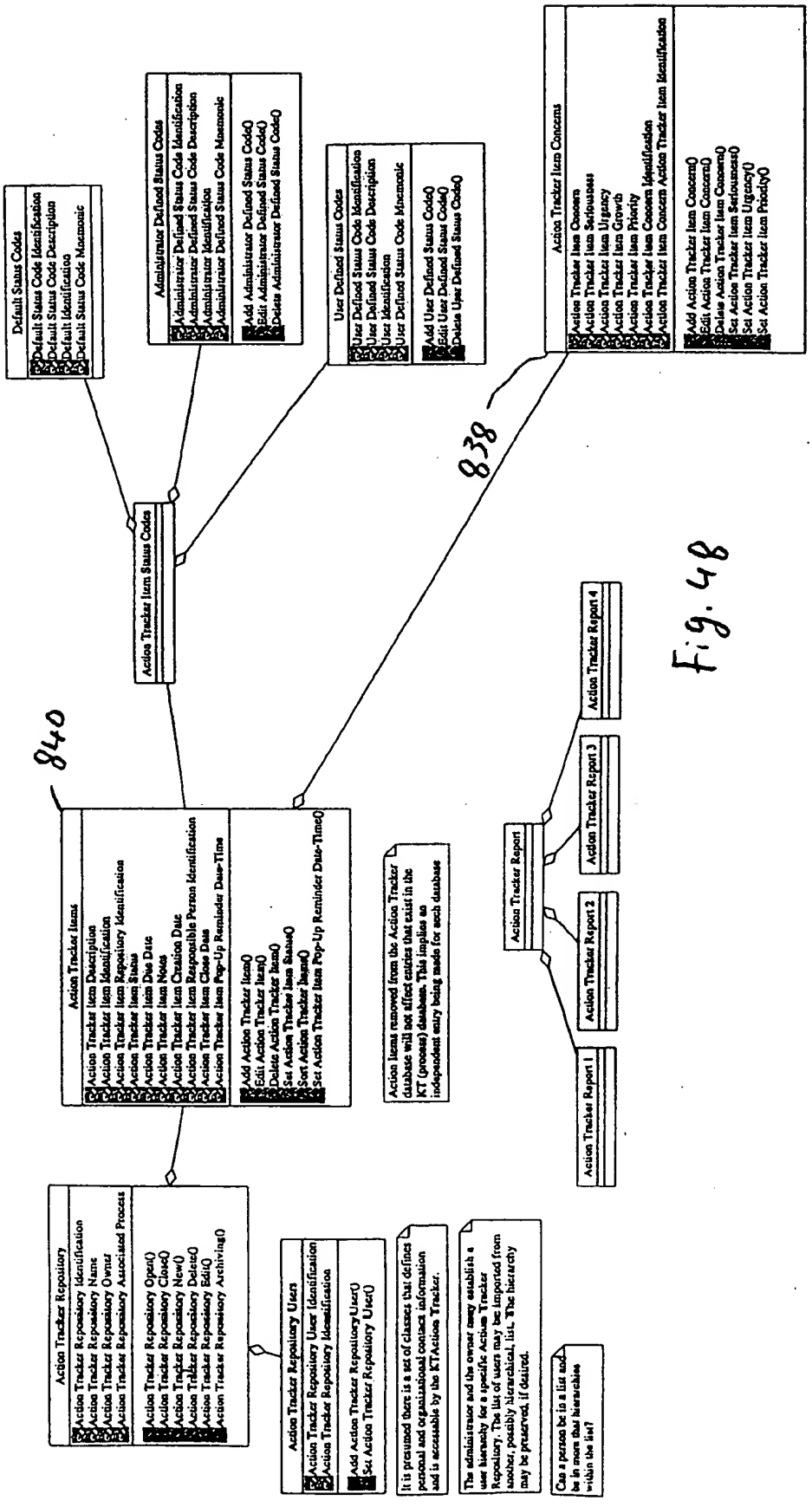
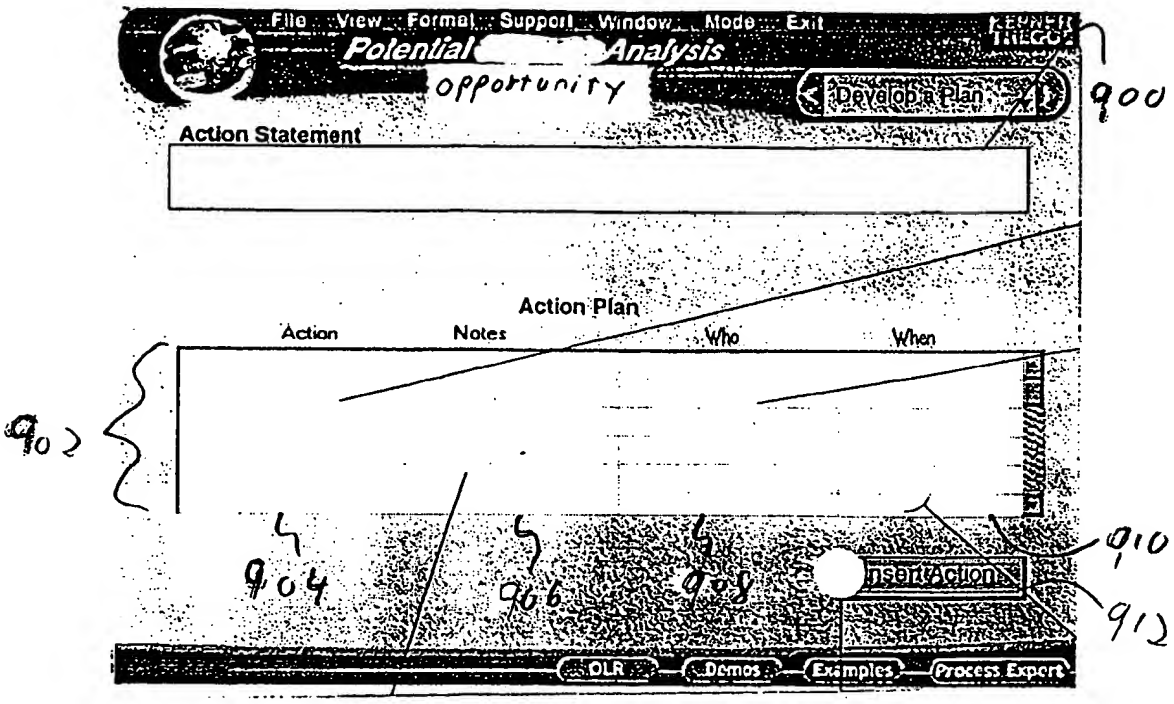
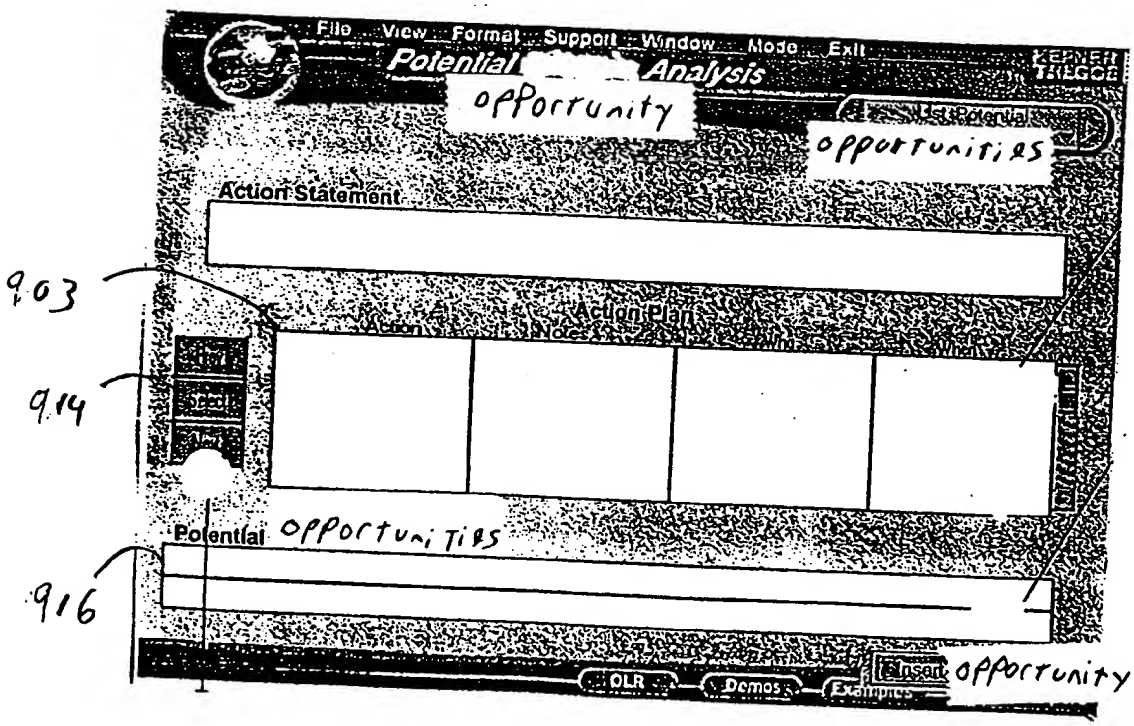

Default Status Codes
Default Status Code Identification
Default Status Code Description
Default Identification
Default Status Code Mnemonic
Administrator Defined Status Codes
Administrator Defined Status Code Identification
Administrator Defined Status Code Description
Administrator Identification
Administrator Defined Status Code Mnemonic
Add Administrator Defined Status Code()
Edit Administrator Defined Status Code()
Delete Administrator Defined Status Code()
User Defined Status Codes
User Defined Status Code Identification
User Defined Status Code Description
User Identification
User Defined Status Code Mnemonic
Add User Defined Status Code()
Edit User Defined Status Code()
Delete User Defined Status Code()
Action Tracker Item Concerns
Action Tracker Item Concern
Action Tracker Item Seriousness
Action Tracker Item Urgency
Action Tracker Item Growth
Action Tracker Item Priority
Action Tracker Item Concern Identification
Action Tracker Item Concern Action Tracker Item Identification
Add Action Tracker Item Concern()
Edit Action Tracker Item Concern()
Delete Action Tracker Item Concern()
Set Action Tracker Item Seriousness()
Set Action Tracker Item Urgency()
Set Action Tracker Item Priority()
Action Tracker Item Status Codes
838
840
Action Tracker Items
Action Tracker Item Description
Action Tracker Item Identification
Action Tracker Item Repository Identification
Action Tracker Item Status
Action Tracker Item Due Date
Action Tracker Item Notes
Action Tracker Item Creation Date
Action Tracker Item Responsible Person Identification
Action Tracker Item Close Date
Action Tracker Item Pop-Up Reminder Date-Time
Add Action Tracker Item()
Edit Action Tracker Item()
Delete Action Tracker Item()
Set Action Tracker Item Status()
Set Action Tracker Item Pop-Up Reminder Date-Time()
Action Items removed from the Action Tracker database will not affect entries that exist in the KT (process) database. This implies an independent entry being made for each database
Action Tracker Report
Action Tracker Report 1
Action Tracker Report 2
Action Tracker Report 3
Action Tracker Report 4
Action Tracker Repository
Action Tracker Repository Identification
Action Tracker Repository Name
Action Tracker Repository Owner
Action Tracker Repository Associated Process
Action Tracker Repository Open()
Action Tracker Repository Closed()
Action Tracker Repository New()
Action Tracker Repository Delete()
Action Tracker Repository Edit()
Action Tracker Repository Archiving()
Action Tracker Repository Users
Action Tracker Repository User Identification
Action Tracker Repository Identification
Add Action Tracker Repository User()
Set Action Tracker Repository User()
It is presumed there is a set of classes that defines personal and organizational contact information and is accessable by the KTAction Tracker.
The administrator and the owner may establish a user hierarchy for a specific Action Tracker Repository. The list of users may be imported from another, possibly hierarchical, list. The hierarchy may be preserved, if desired.
Can a person be in a list and be in more than hierarchies within the list?

Fig. 48


File View Format Support Window Mode Exit
Potential Analysis
opportunity
Develop a Plan
900
Action Statement
Action Plan
Action
Notes
Who
When
902
904
906
908
910
Insert Action
912
OLR
Demos
Examples
Process Expert

F:g. 49


File View Format Support Window Mode Exit
Potential Analysis
opportunity
Potential opportunities
Action Statement
903
Action Plan
914
Potential opportunities
916
OLR
Demos
opportunity

F:g. 50

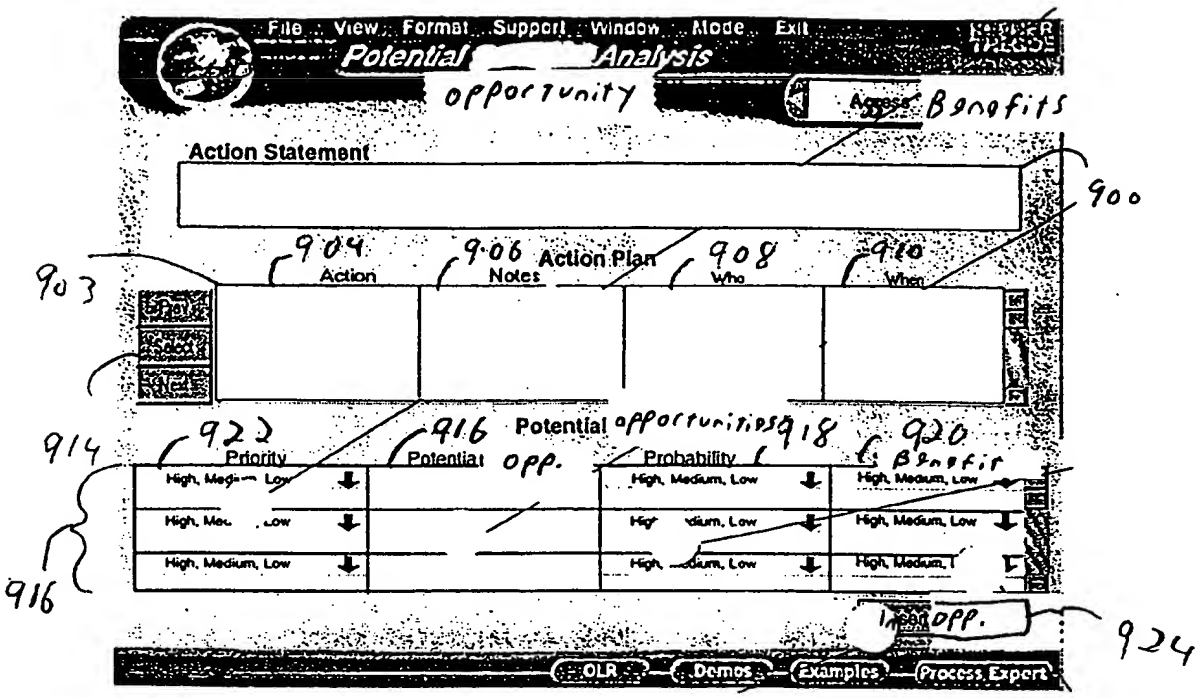

File View Format Support Window Mode Exit
Potential Analysis
opportunity
Access Benefits
Action Statement
900
903
904 Action
906 Notes
Action Plan
908 Who
910 When
914
916
922 Priority
916 Potential opp.
Potential opportunities
918
920 Benefit
High, Medium, Low
Insert opp.
924
OLR
Demos
Examples
Process Expert

Fig. 51

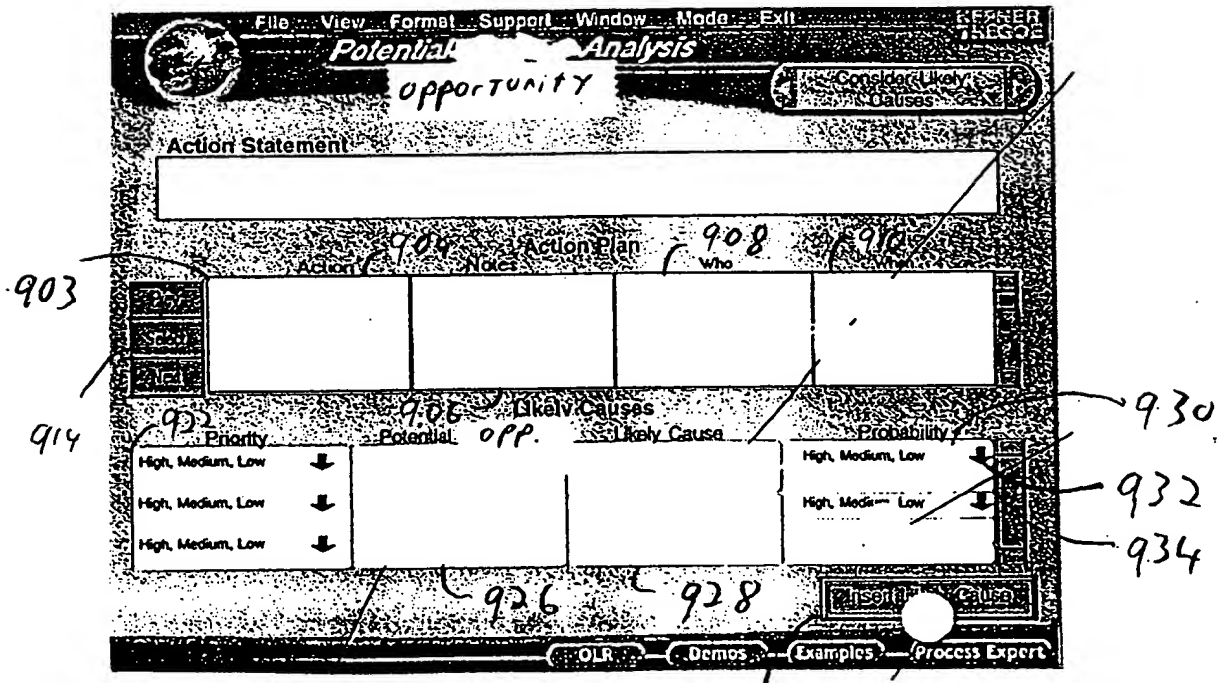

File View Format Support Window Mode Exit
Potential Analysis
opportunity
Consider Likely Causes
Action Statement
903
904 Action
Notes
Action Plan
908 Who
910
914
922 Priority
906 Potential opp.
Likely Causes
Likely Cause
Probability
930
932
934
High, Medium, Low
926
928
Insert
Cause
OLR
Demos
Examples
Process Expert
936

Fig. 52

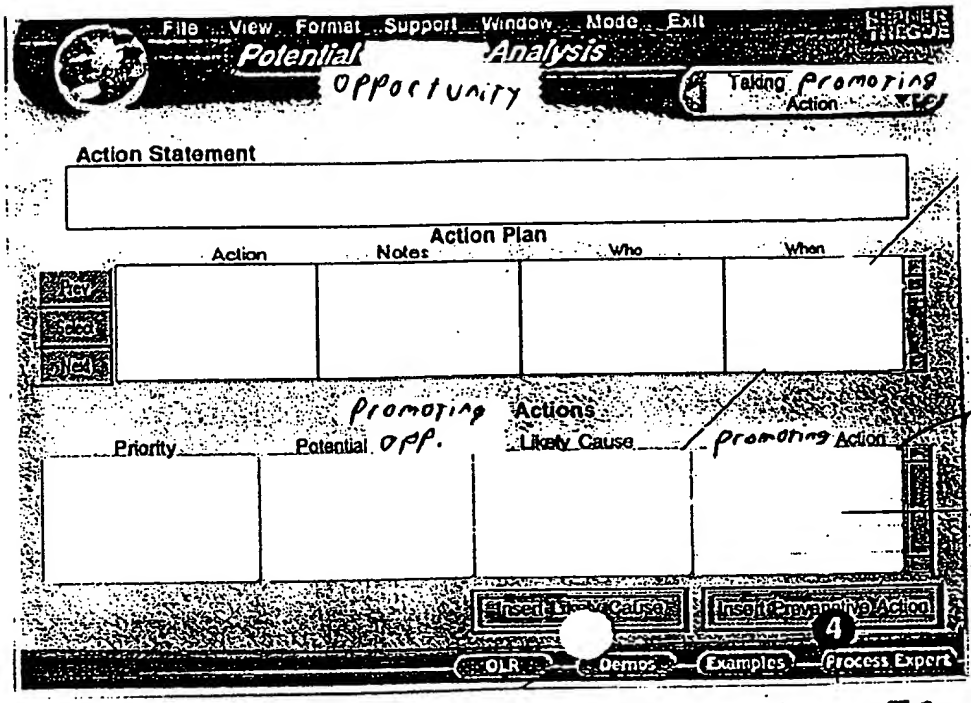

File View Format Support Window Mode Exit
Potential Opportunity Analysis
Taking Promoting Action
Action Statement
Action Plan
Action
Notes
Who
When
Priority
Potential Opp.
Promoting Actions
Likely Cause
Promoting Action
938
Insert Preventive Action
OLR
Demos
Examples
Process Expert
4

Fig. 53

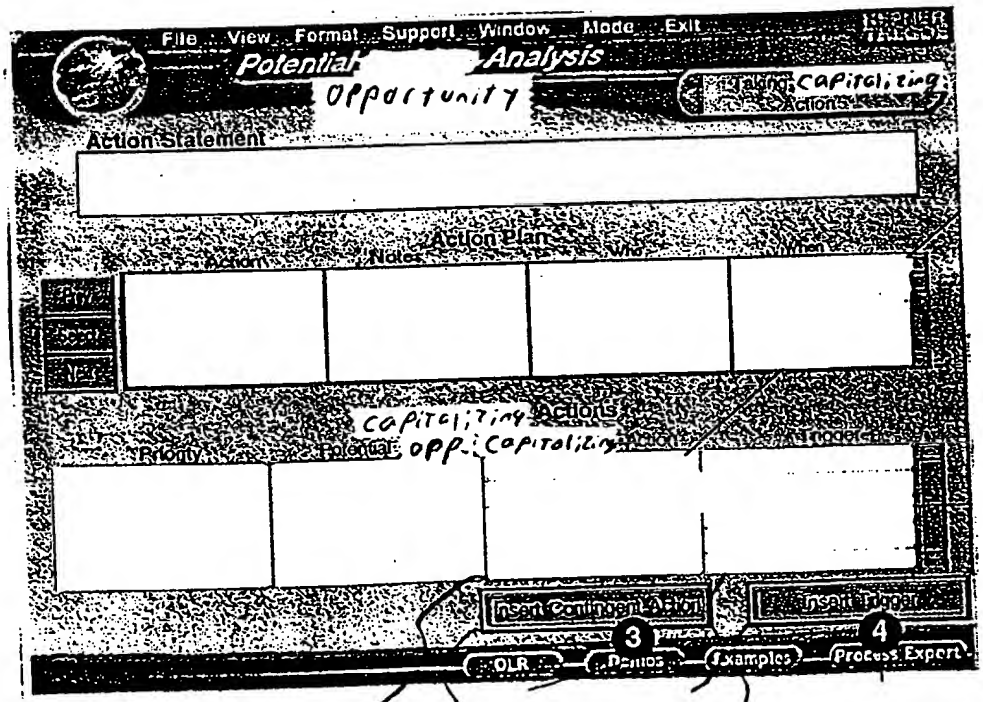

File View Format Support Window Mode Exit
Potential Opportunity Analysis
Taking Capitalizing Actions
Action Statement
Action Plan
Action
Notes
Who
When
Priority
Potential Opp.
Capitalizing Actions
Capitalizing Action
Insert Component Action
Insert Support
OLR
Demos
Examples
Process Expert
3
4
939
942
940
944

Fig. 54

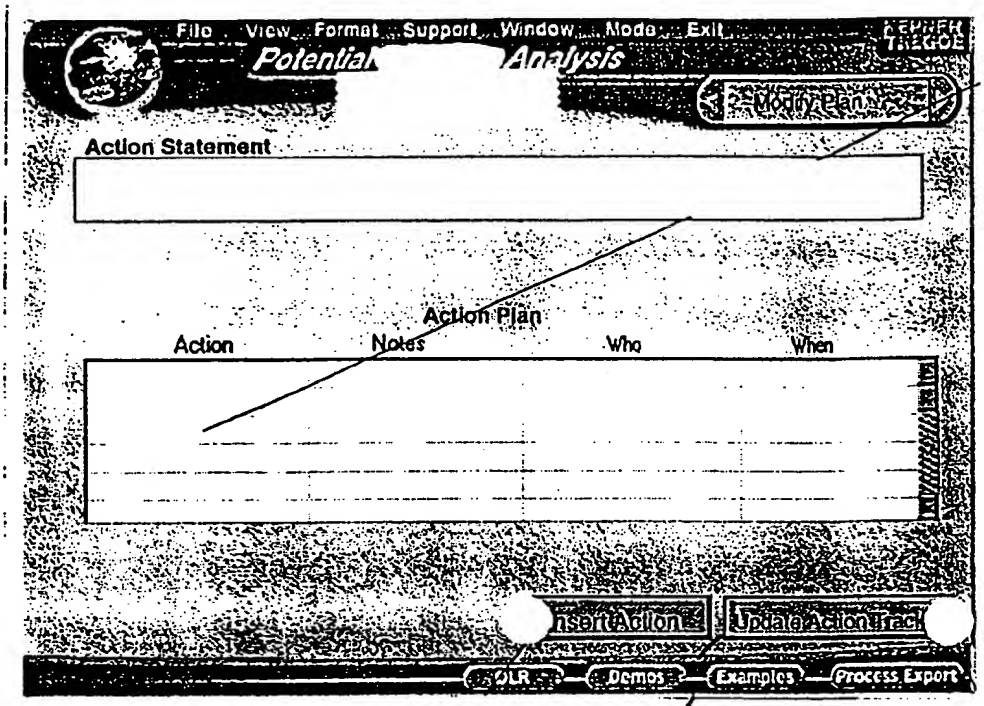

File View Format Support Window Mode Exit
Potential Analysis
Modify Plan
Action Statement
Action Plan
Action
Notes
Who
When
Insert Action
Update Action Track
OLR
Demos
Examples
Process Export
946

Fig. 55

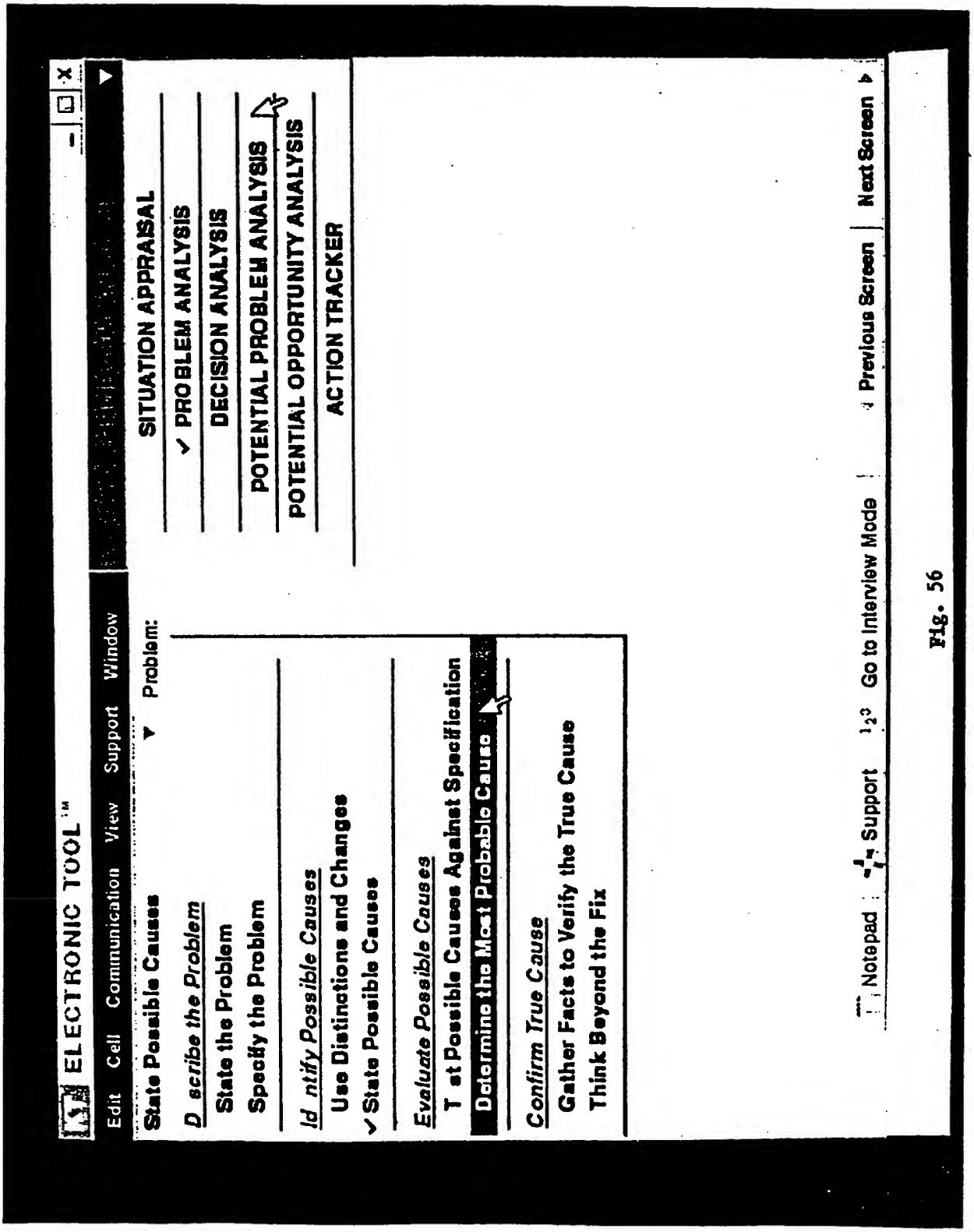

ELECTRONIC TOOL™
Edit Cell Communication View Support Window
State Possible Causes
Problem:
D scribe the Problem
State the Problem
Specify the Problem
Id ntify Possible Causes
Use Distinctions and Changes
State Possible Causes
Evaluate Possible Causes
T st Possible Causes Against Specification
Determine the Most Probable Cause
Confirm True Cause
Gather Facts to Verify the True Cause
Think Beyond the Fix
SITUATION APPRAISAL
PROBLEM ANALYSIS
DECISION ANALYSIS
POTENTIAL PROBLEM ANALYSIS
POTENTIAL OPPORTUNITY ANALYSIS
ACTION TRACKER
Notepad
Support
Go to Interview Mode
Previous Screen
Next Screen

Fig. 56

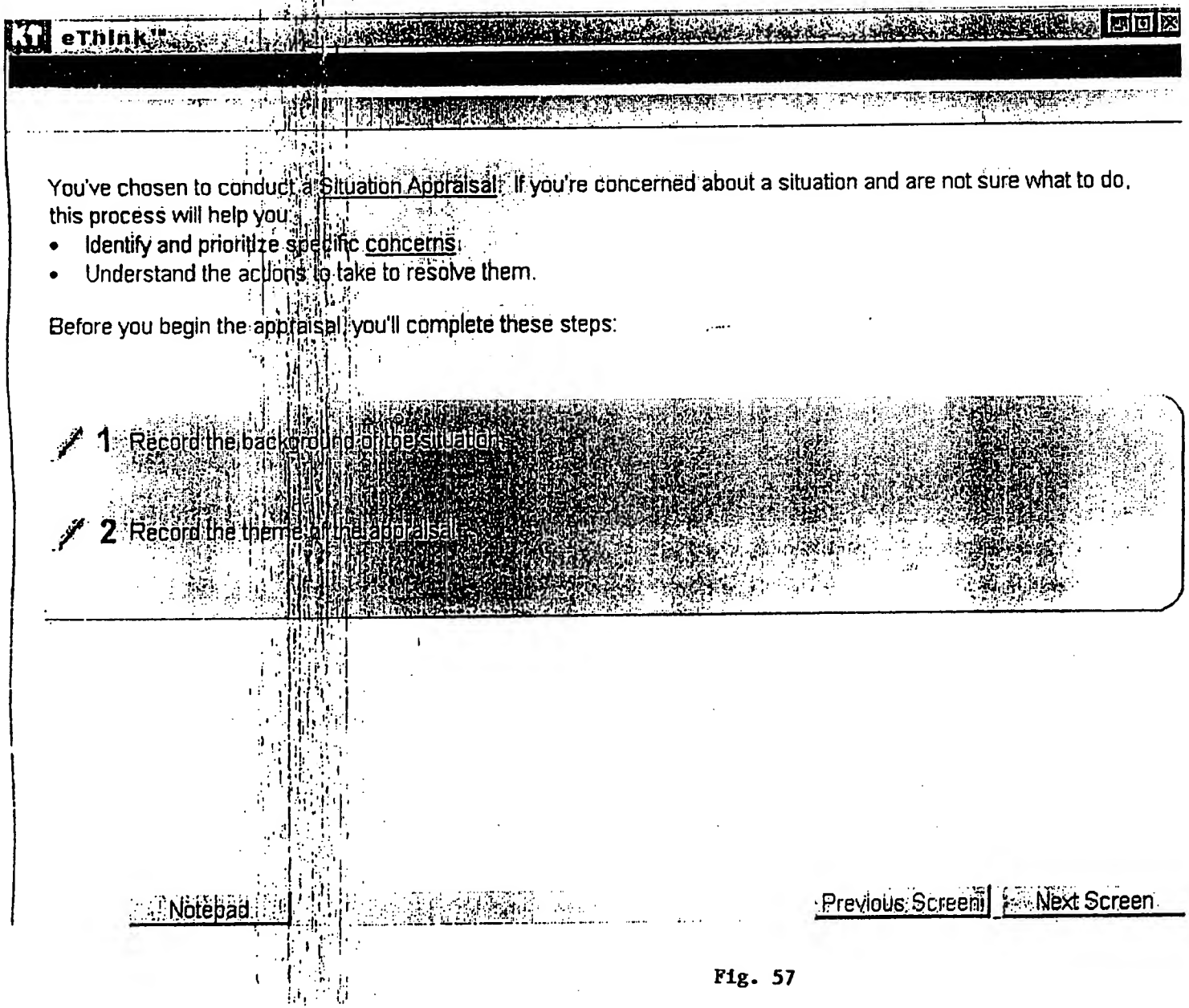

KT eThink™
You've chosen to conduct a Situation Appraisal. If you're concerned about a situation and are not sure what to do, this process will help you:
• Identify and prioritize specific concerns.
• Understand the actions to take to resolve them.
Before you begin the appraisal, you'll complete these steps:
1 Record the background of the situation.
2 Record the theme of the appraisal.
Notepad
Previous Screen
Next Screen

Fig. 57

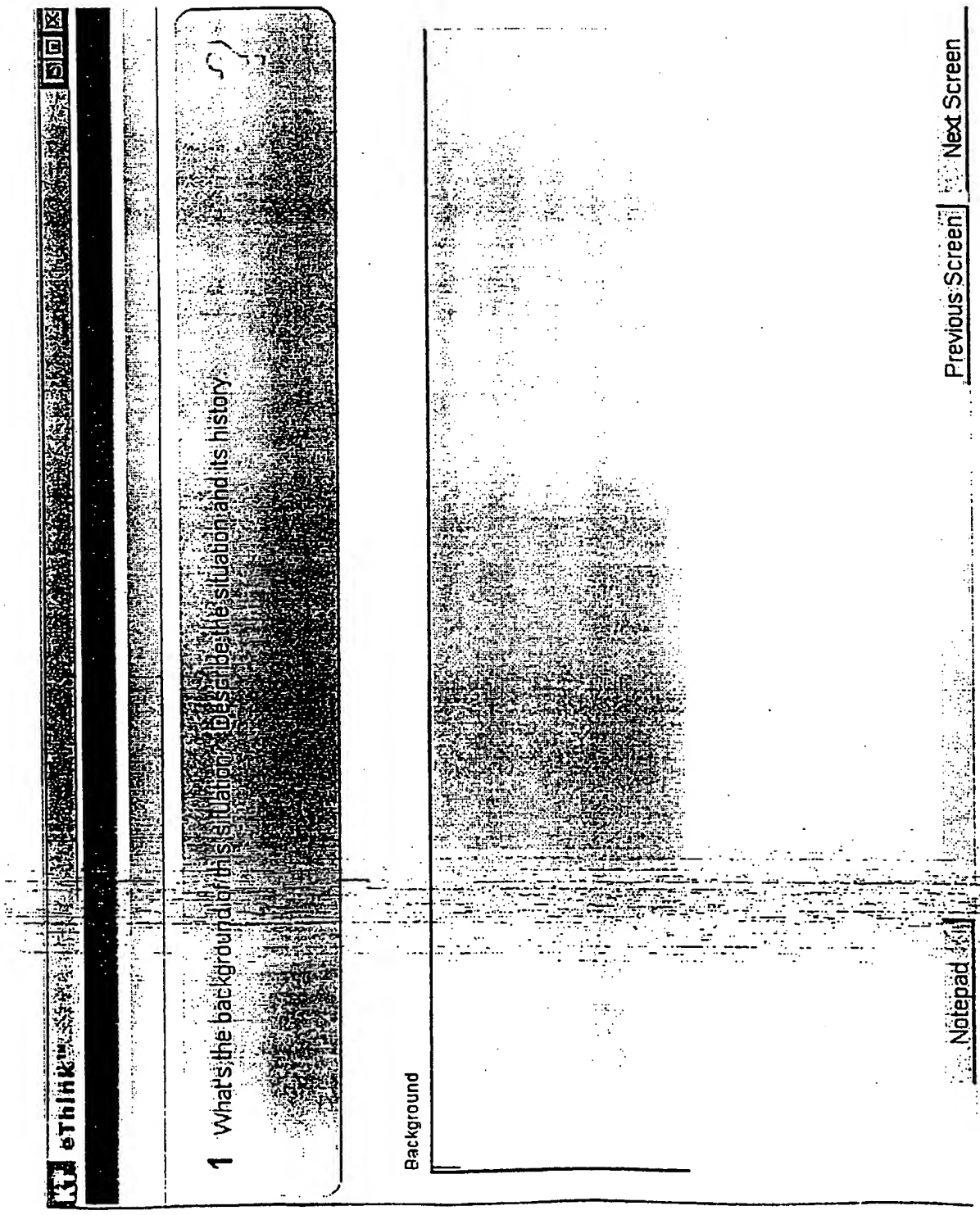

eThink
1 What's the background of this situation? Describe the situation and its history.
Background
Notepad
Previous Screen
Next Screen

Fig.58

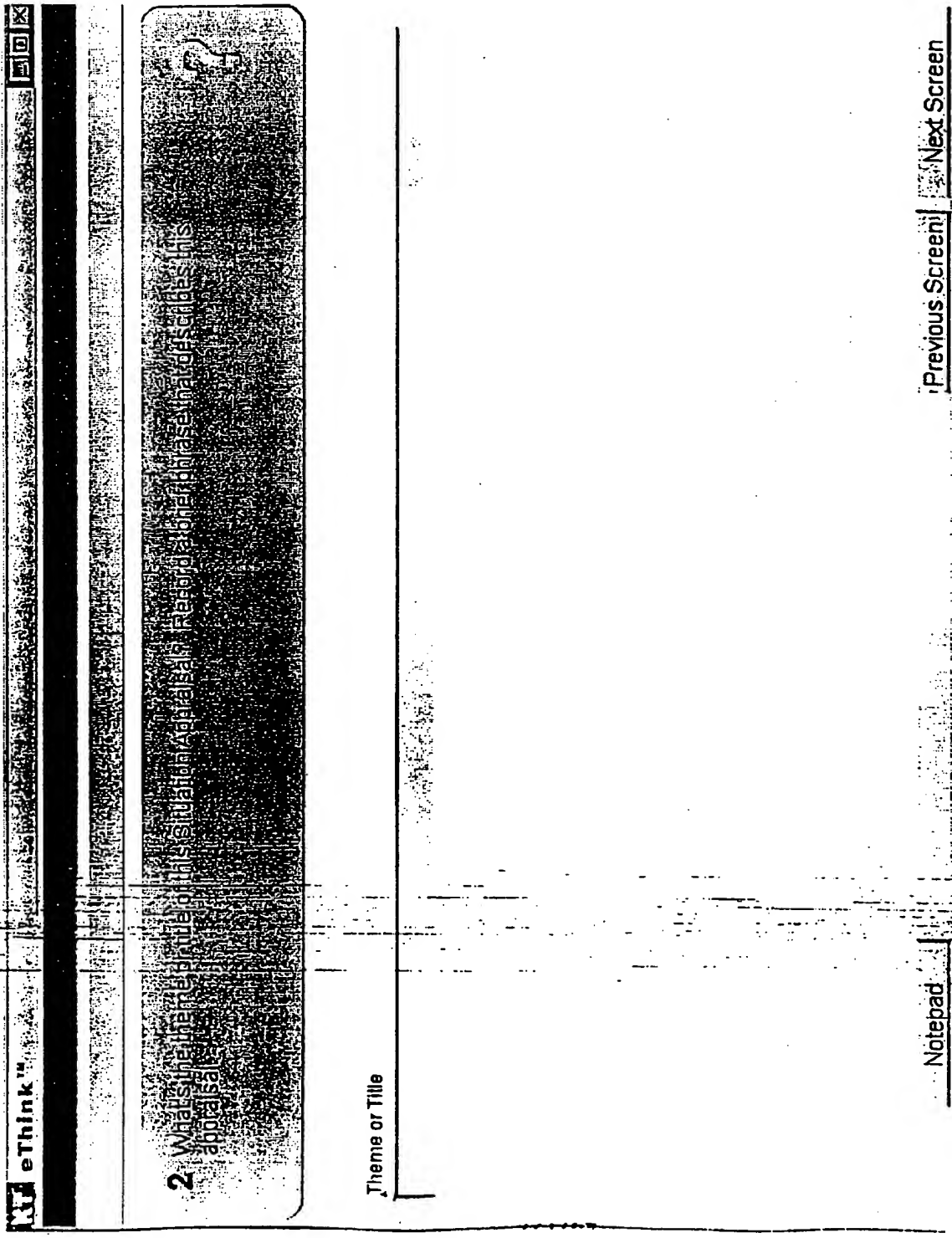

eThink™
2.
Theme or Title
Notepad
Previous Screen
Next Screen

Fig. 59

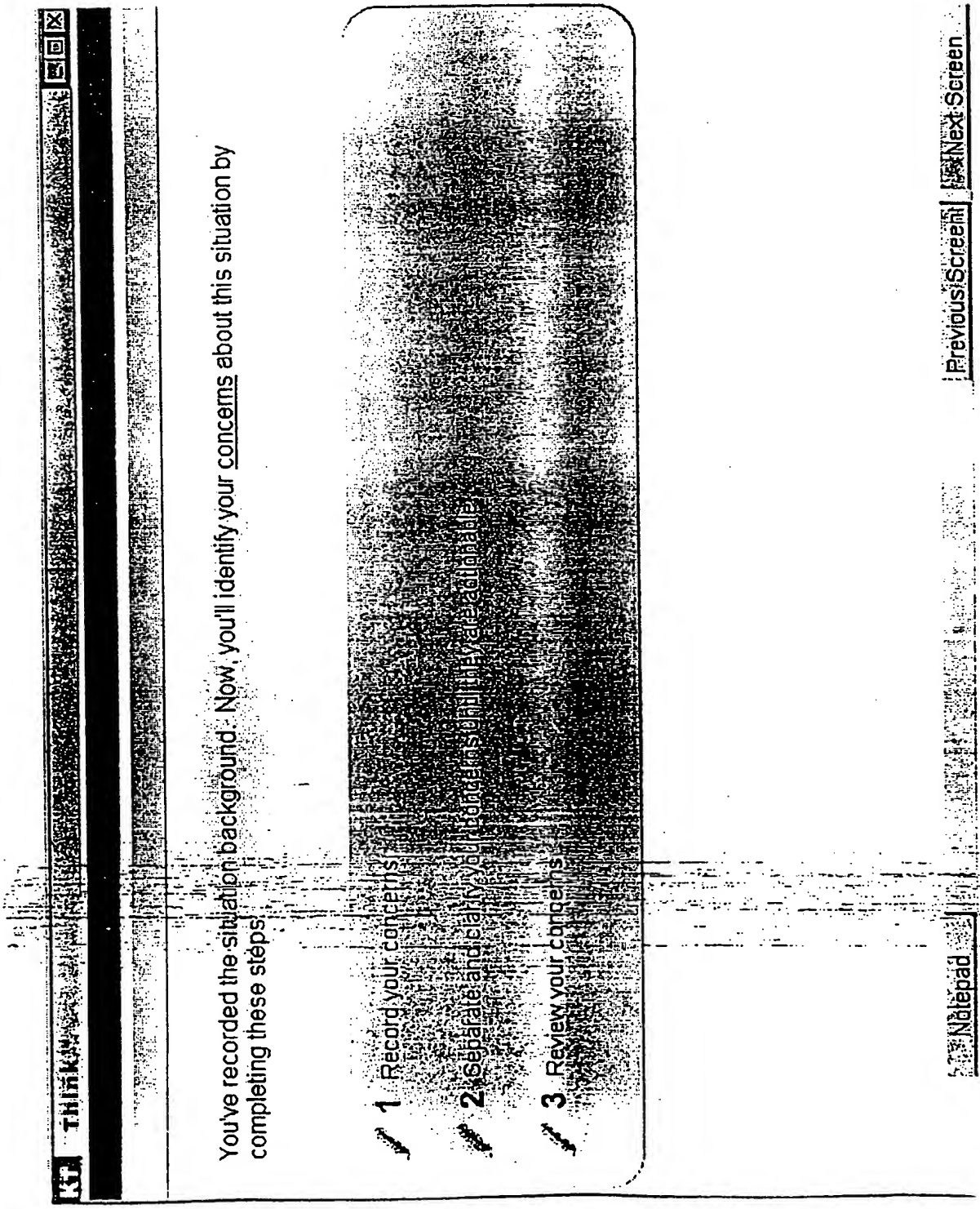

KT Think
You've recorded the situation background. Now, you'll identify your concerns about this situation by completing these steps:
1 Record your concerns
2 Separate and clarify your concerns
3 Review your concerns
Notepad
Previous Screen
Next Screen

Fig. 60

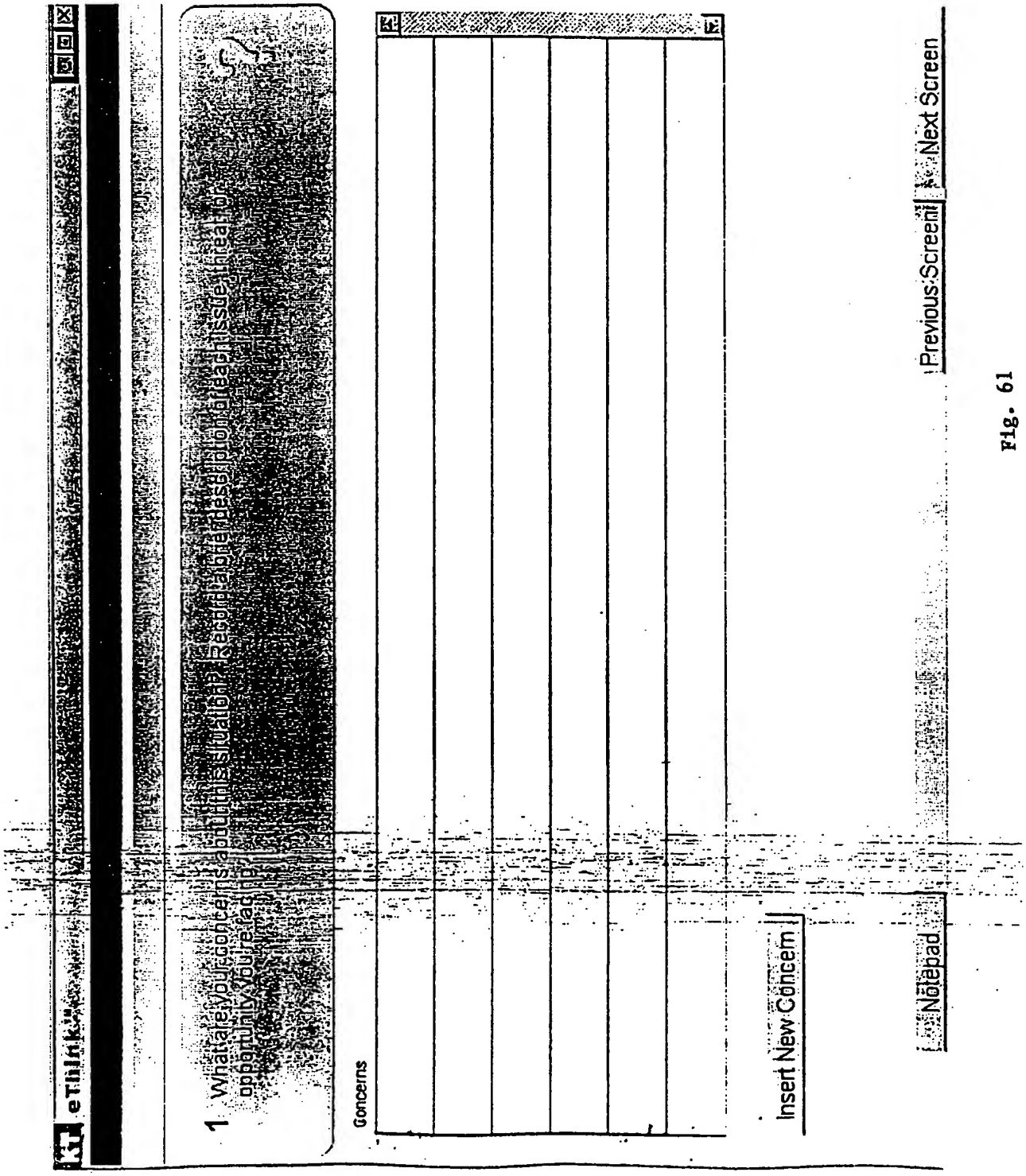

eThink
1 What are your concerns about this situation? Record a brief description of each issue that
opportunity you're facing
Concerns
Insert New Concern
Notepad
Previous Screen
Next Screen

Fig. 61

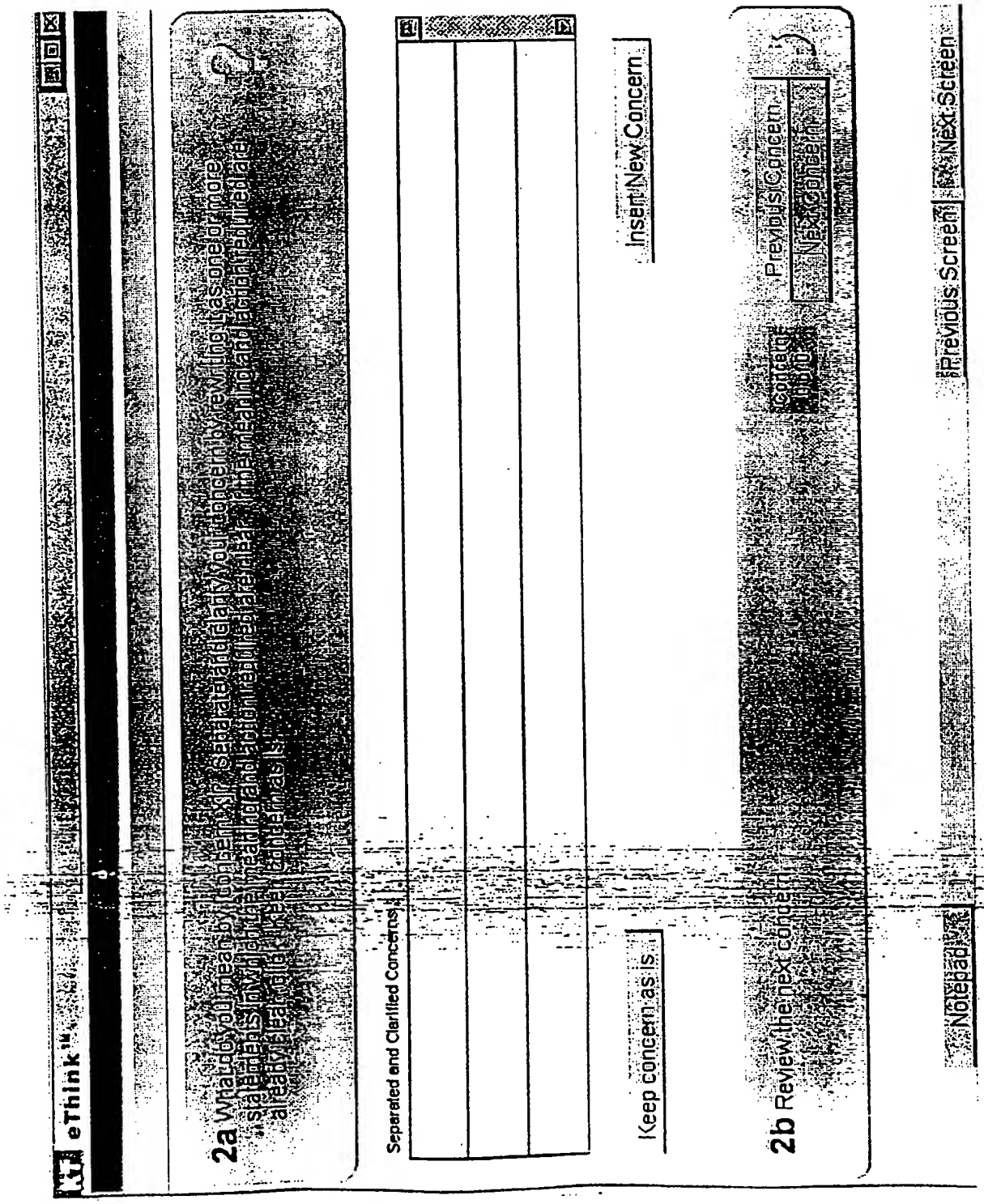

eThink™
2a
Separated and Clarified Concerns
Insert New Concern
Keep concern as is
2b
Previous Concern
Next Concern
Notepad
Previous Screen
Next Screen

Fig. 62

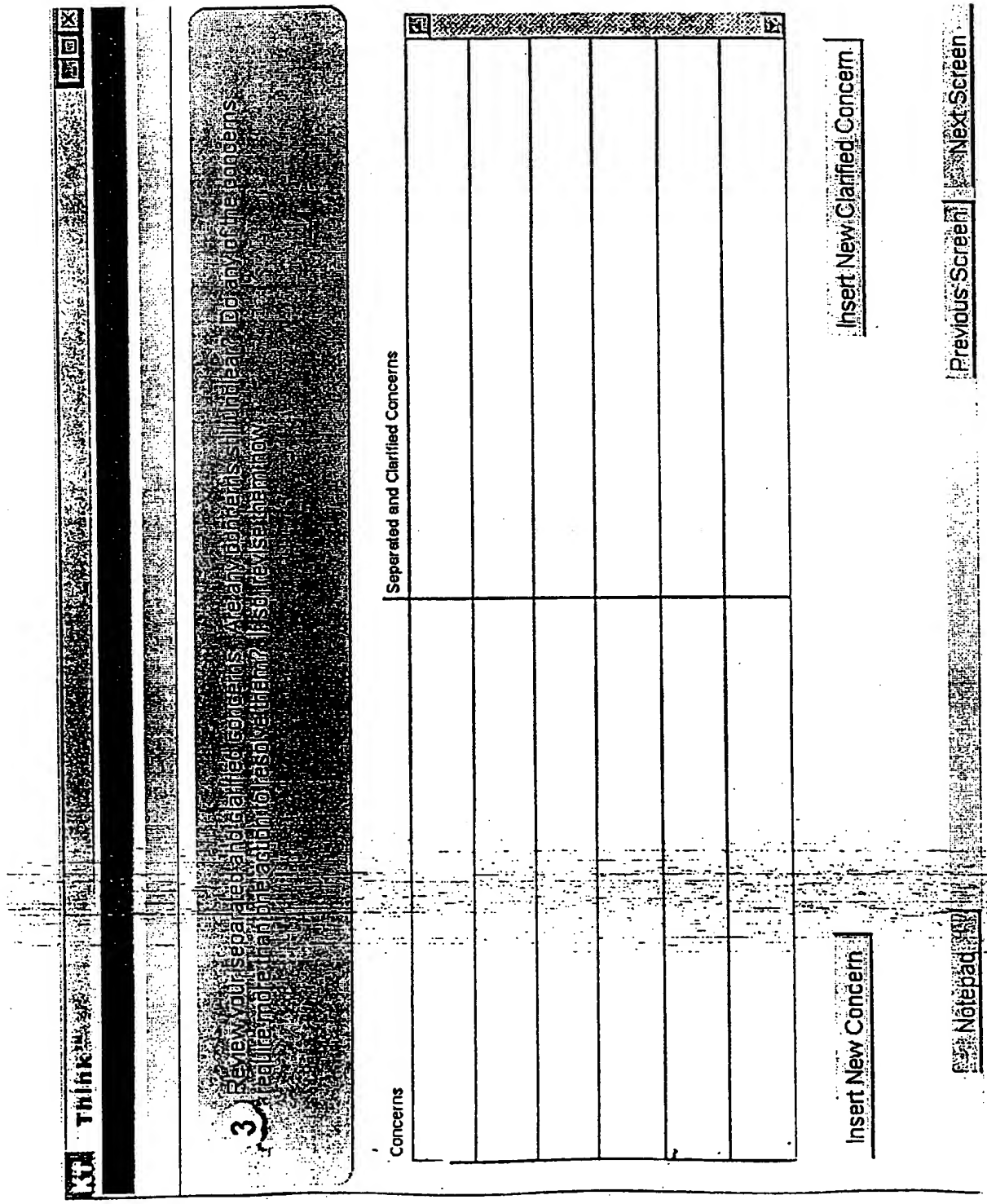

Think
3
Review your separated and clarified concerns. Are any concerns still unclear? Do any of the concerns
Separated and Clarified Concerns
Concerns
Insert New Clarified Concern
Insert New Concern
Notepad
Previous Screen
Next Screen

Fig. 63

ThInK!!
You've identified and clarified your concerns. In the next section, you'll set priority for resolving your concerns. Is the order in which the concerns need to be resolved clear?
Yes, and I would like to set the priority now
No, I need to determine the Current Impact, Future Impact, and Time Frame of each concern before I can determine the priority
Notepad
Previous Screen
Next Screen

Fig. 64

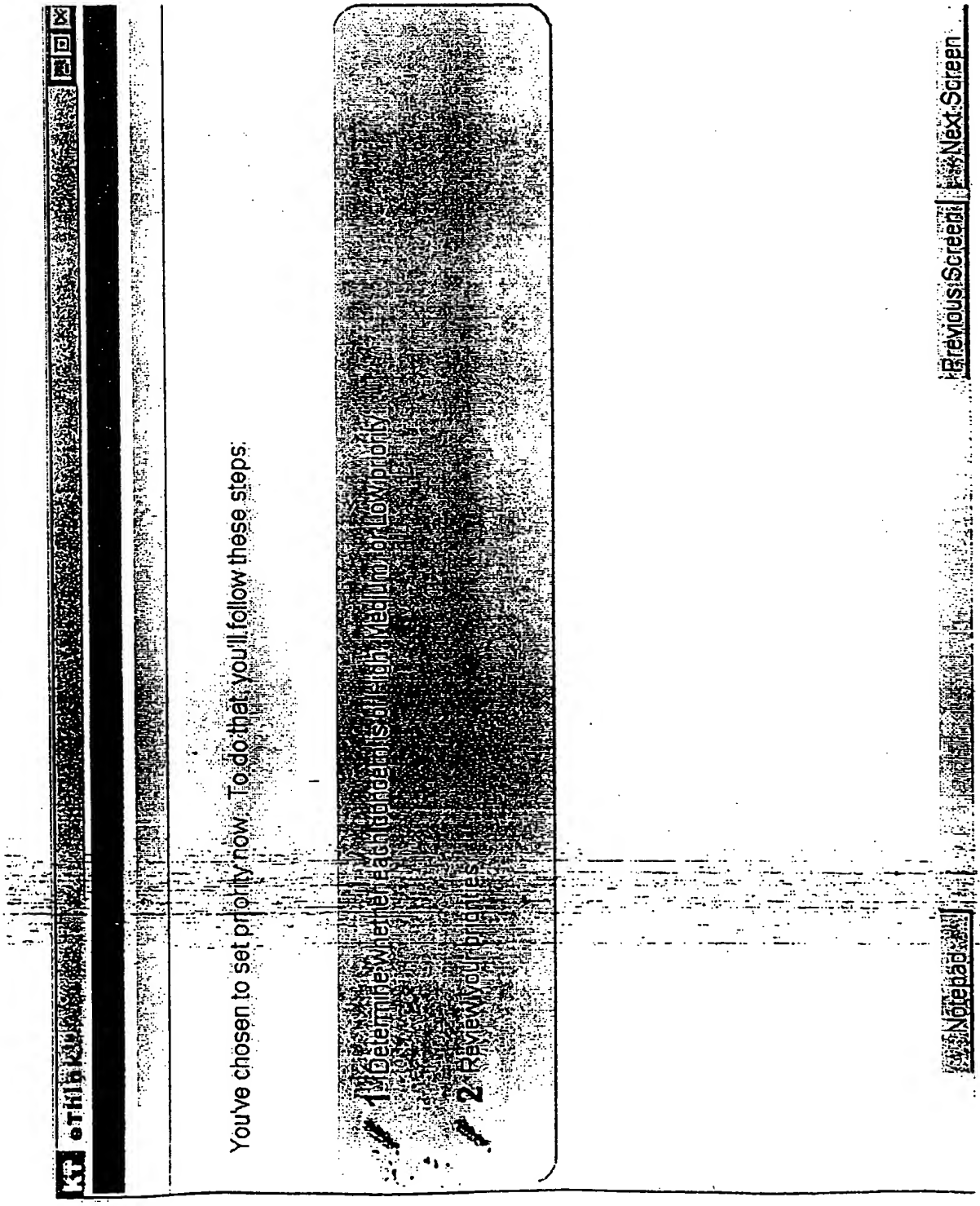

You've chosen to set priority now. To do that, you'll follow these steps:
1. Determine whether each task is High, Medium or Low priority
2. Review your priorities
Notepad
Previous Screen
Next Screen

Fig. 65

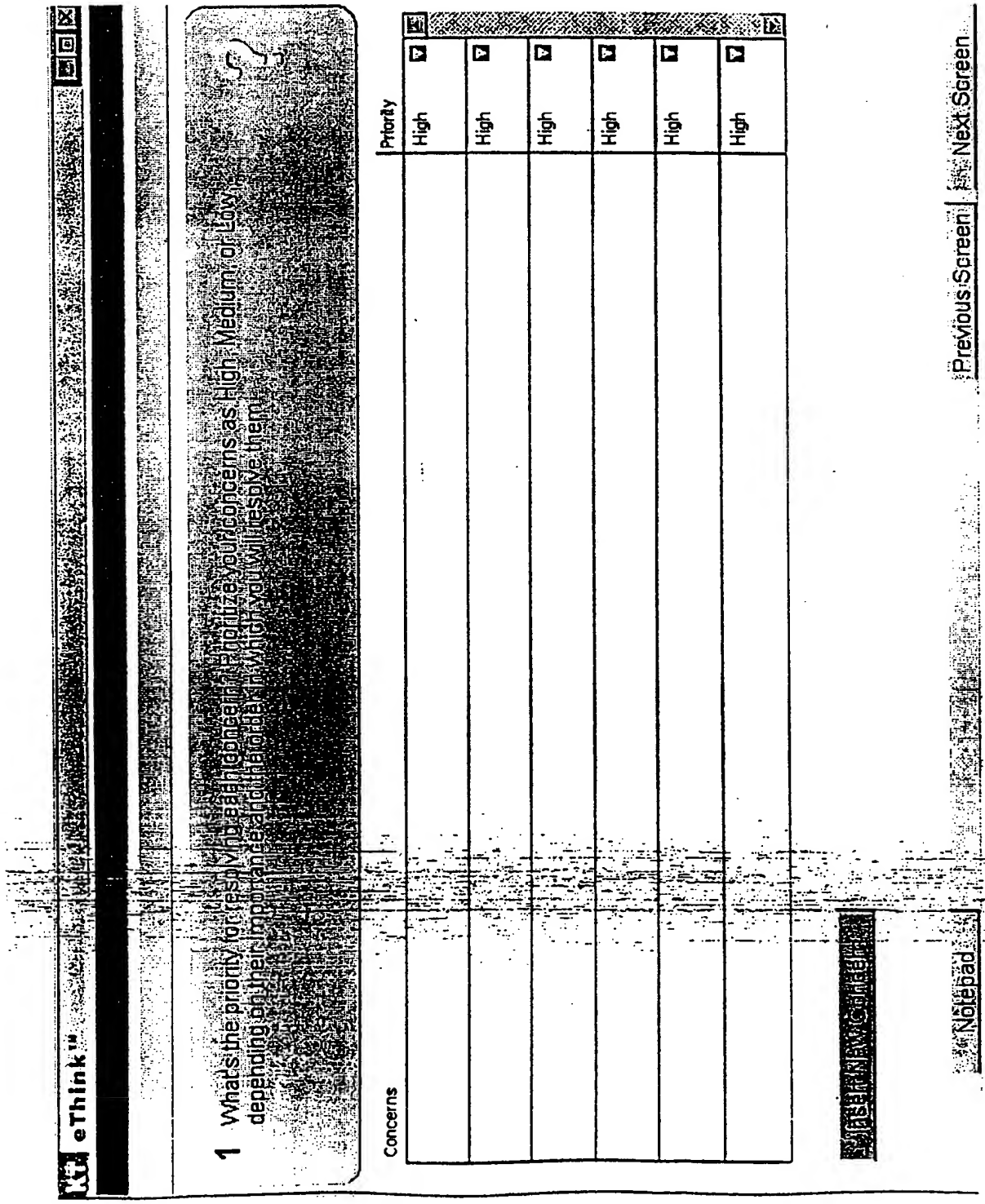

eThink™
1 What's the priority for each concern? Prioritize your concerns as High, Medium or Low depending on their importance. Which you will resolve them
Concerns
Priority
High
High
High
High
High
High
Notebad
Previous Screen
Next Screen

Fig. 66

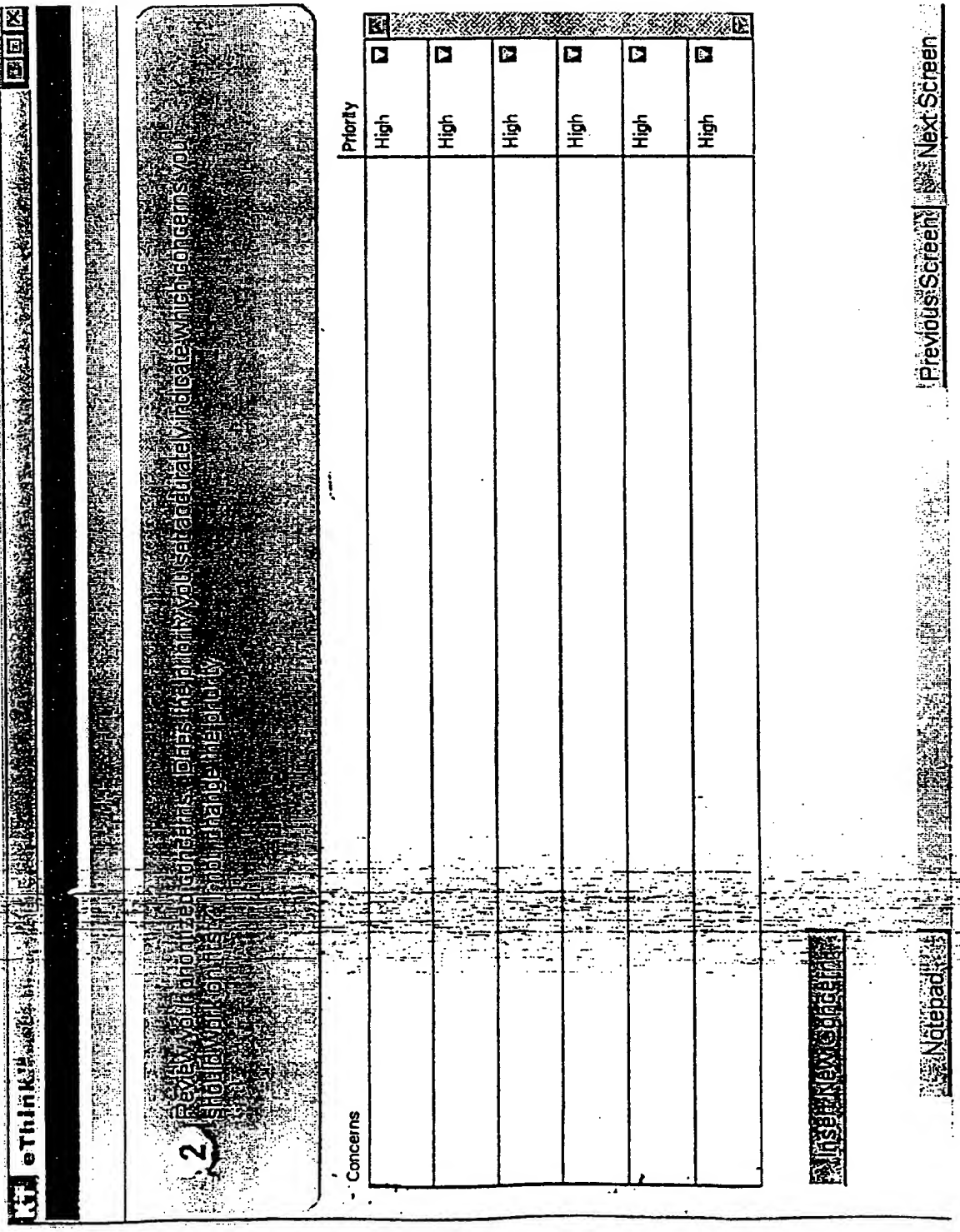

eThink
Priority
High
Concerns
Previous Screen
Next Screen
Notepad

Fig. 67

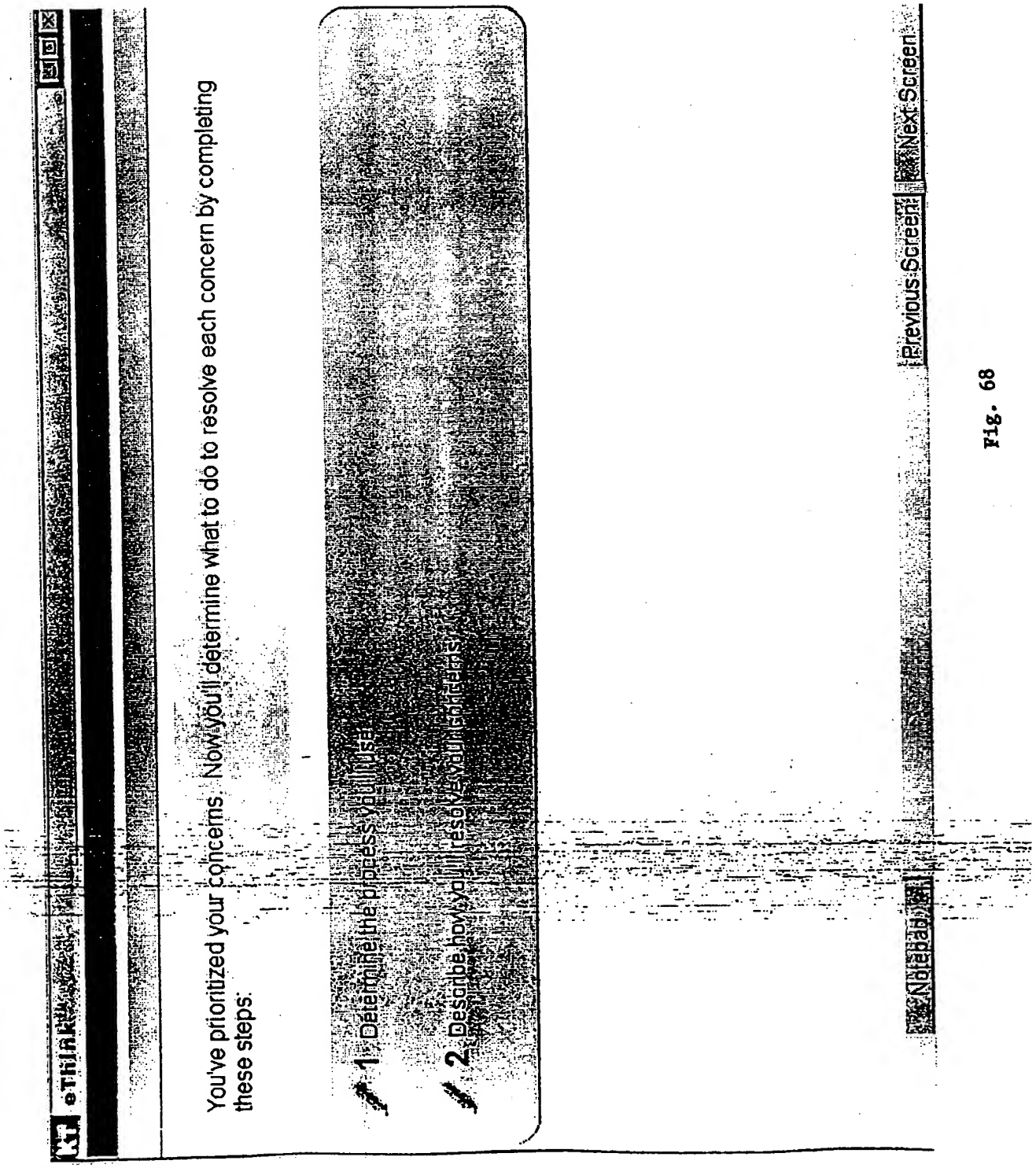

You've prioritized your concerns. Now you'll determine what to do to resolve each concern by completing these steps:
1
2
Notepad
Previous Screen
Next Screen

Fig. 68

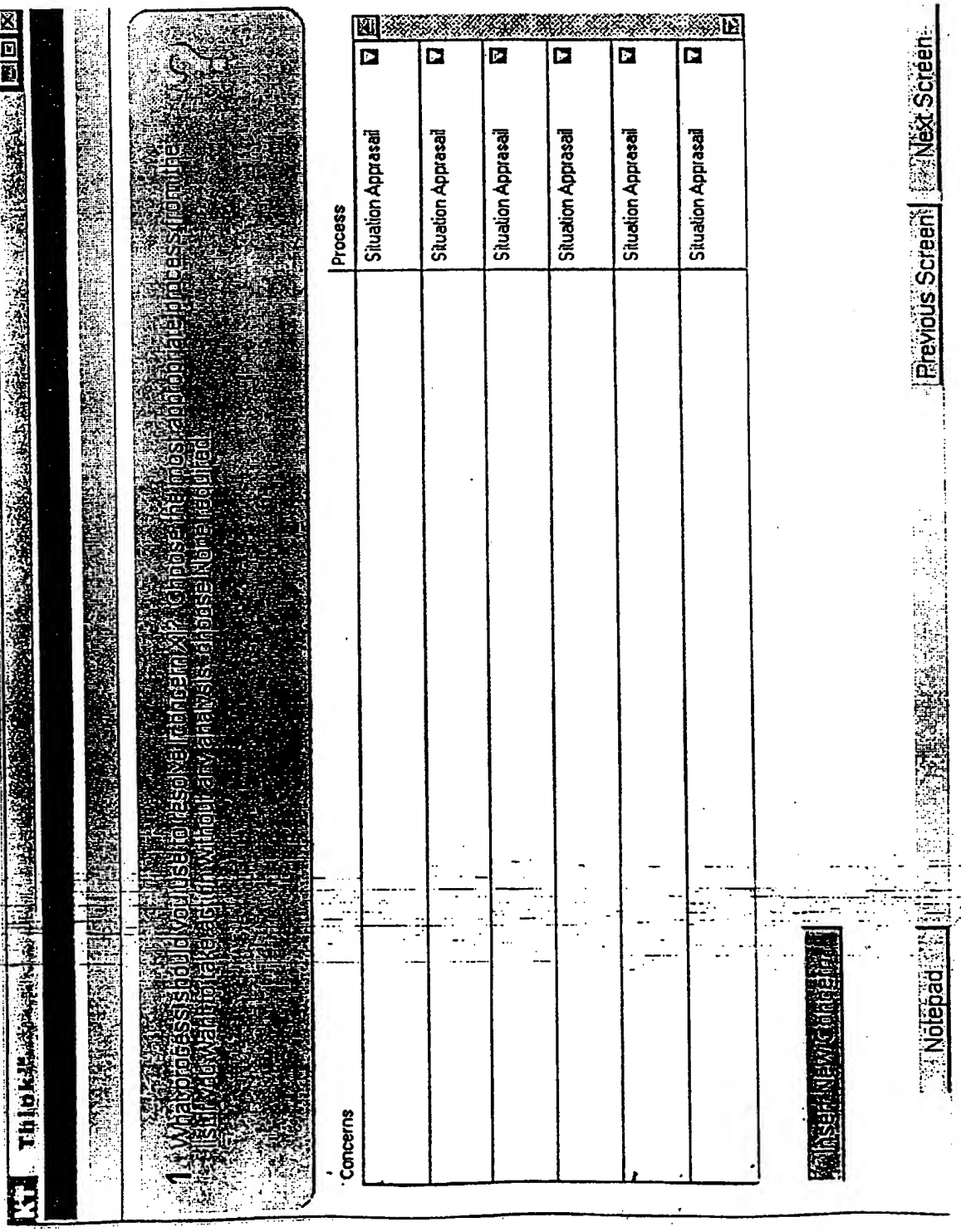

Process
Situation Appraisal
Situation Appraisal
Situation Appraisal
Situation Appraisal
Situation Appraisal
Situation Appraisal
Concerns
Notepad
Previous Screen
Next Screen

Fig. 69

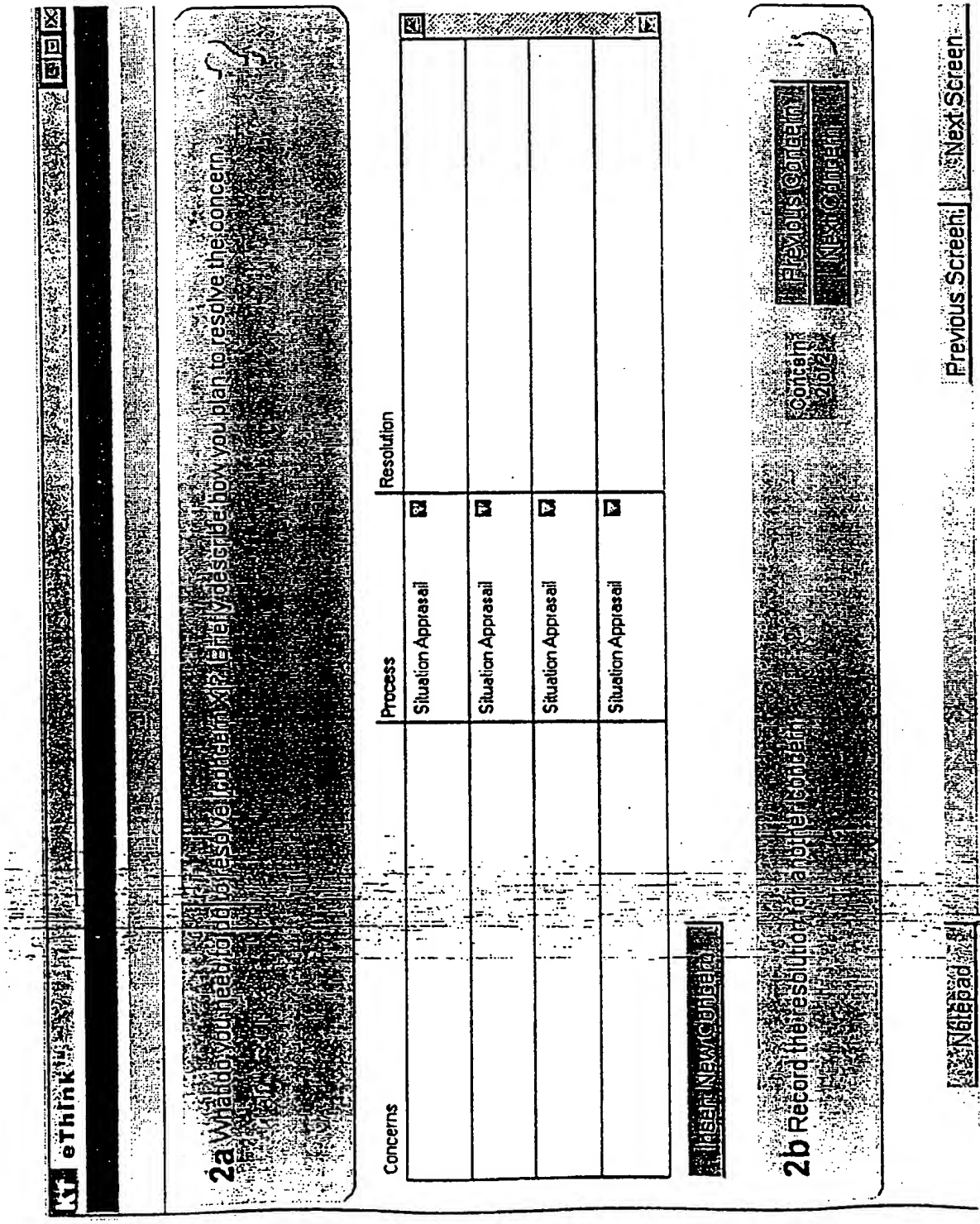

eThink
2a What do you need to do to resolve problem x? Briefly describe how you plan to resolve the concern.
Concerns
Process
Resolution
Situation Appraisal
Situation Appraisal
Situation Appraisal
Situation Appraisal
Insert New Concern
2b Record the resolution for another concern
Concern #2 of 2
Previous Concern
Next Concern
Notepad
Previous Screen
Next Screen

Fig. 70

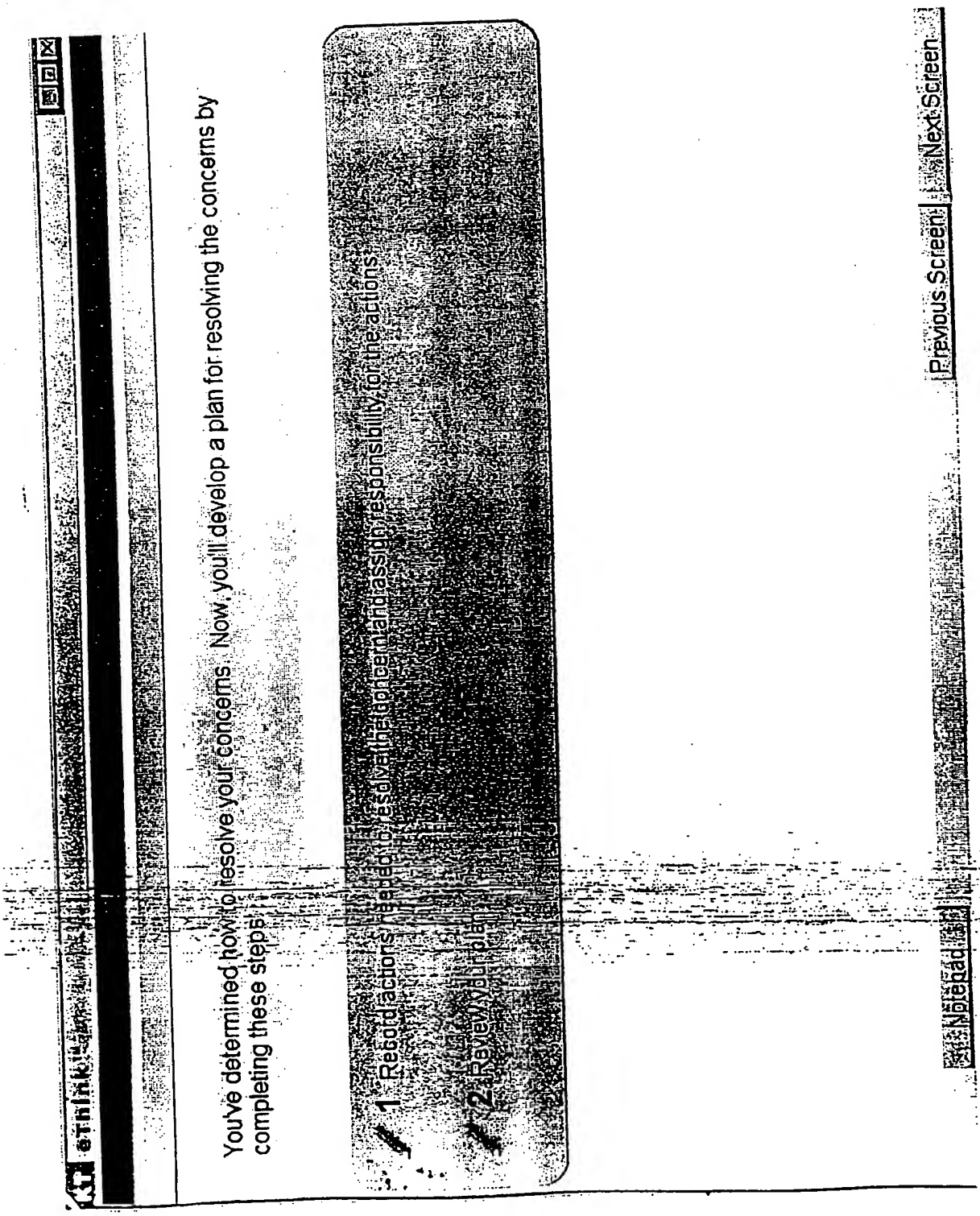

You've determined how to resolve your concerns. Now, you'll develop a plan for resolving the concerns by completing these steps.
1. Record actions you'll take to resolve the concern and assign responsibility for the actions.
2. Review your plan
Previous Screen
Next Screen

Fig. 71

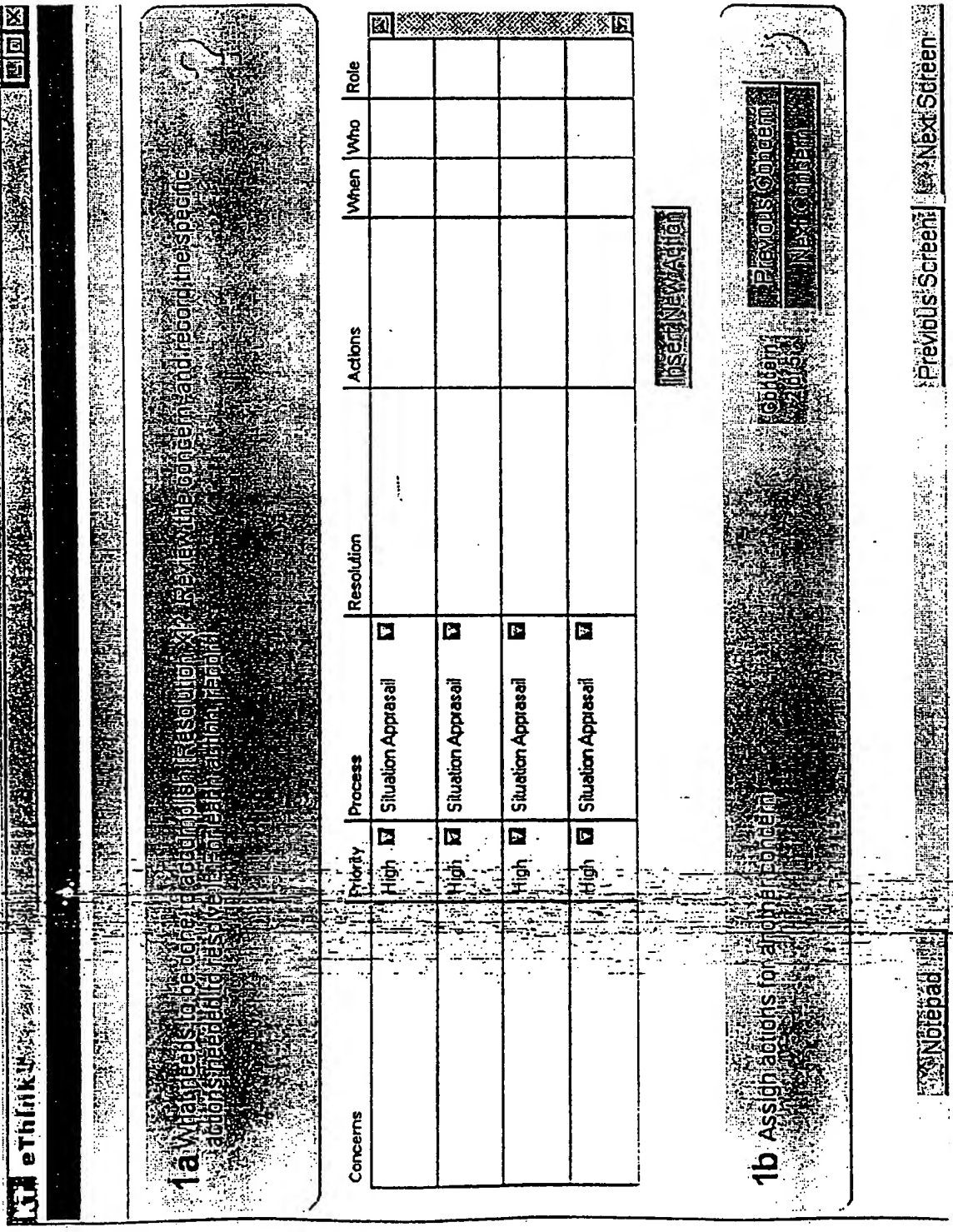

eThink!
1a
Concerns
Priority
Process
Resolution
Actions
When
Who
Role
High
Situation Appraisal
Insert New Action
1b
Assign actions for another concern
Previous Concern
Next Concern
Notepad
Previous Screen
Next Screen

Fig. 72

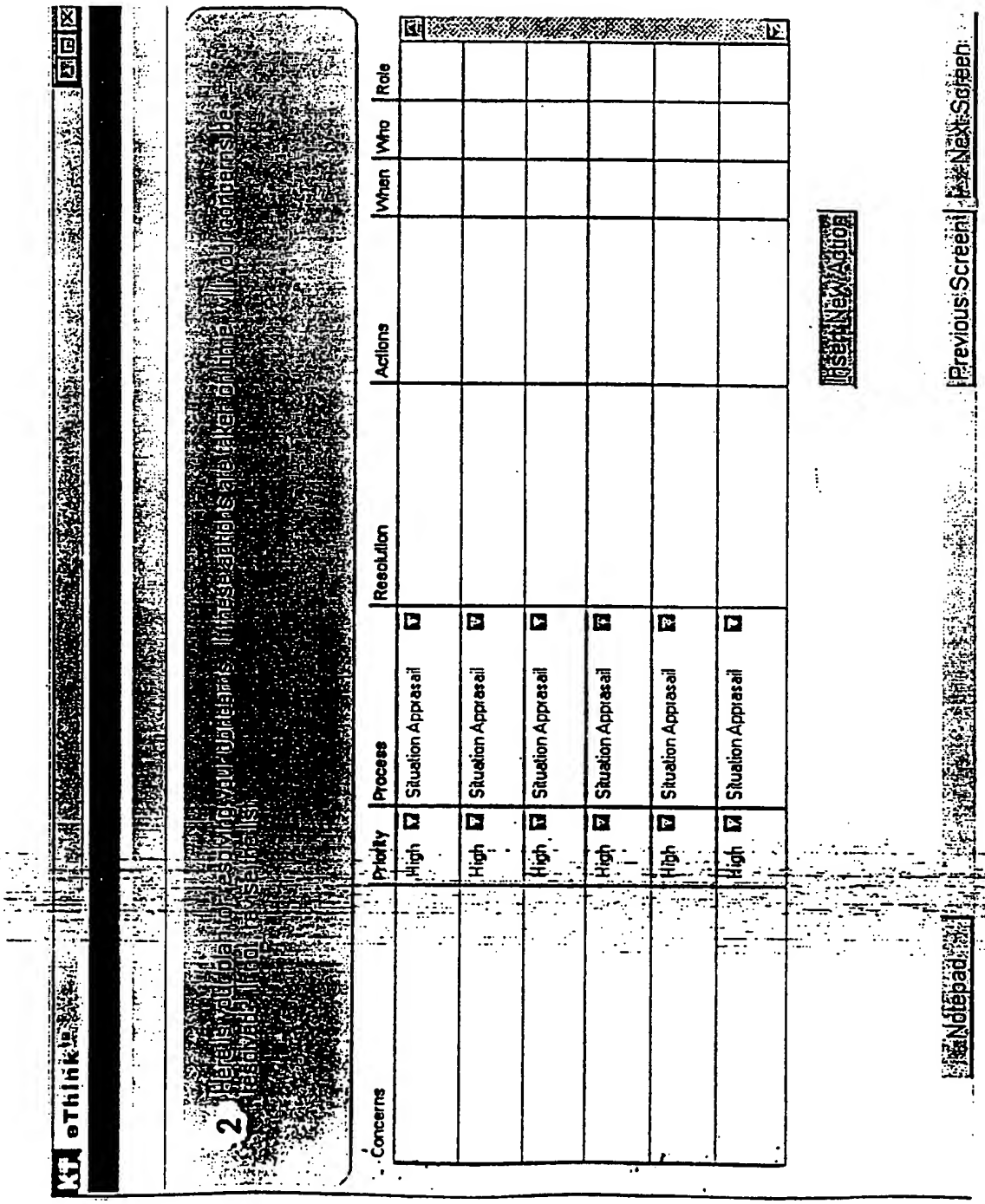

eThink
2
Concerns
Priority
Process
Resolution
Actions
When
Who
Role
High
Situation Appraisal
Notepad
Previous Screen
Next Screen

Fig. 73

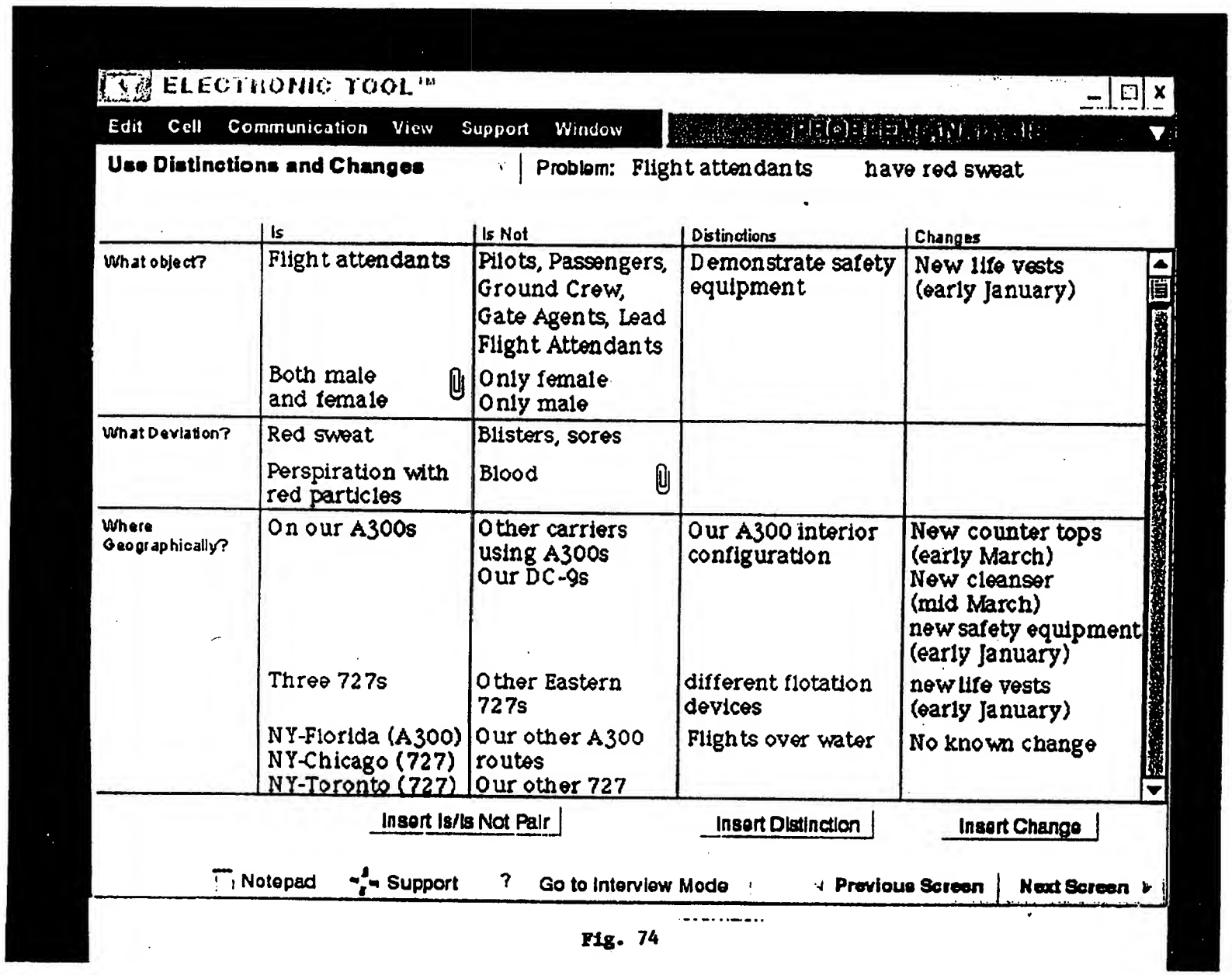

ELECTRONIC TOOL™
Edit Cell Communication View Support Window
Use Distinctions and Changes
Problem: Flight attendants have red sweat
Is
Is Not
Distinctions
Changes
What object?
Flight attendants
Pilots, Passengers, Ground Crew, Gate Agents, Lead Flight Attendants
Demonstrate safety equipment
New life vests (early January)
Both male and female
Only female
Only male
What Deviation?
Red sweat
Blisters, sores
Perspiration with red particles
Blood
Where Geographically?
On our A300s
Other carriers using A300s
Our DC-9s
Our A300 interior configuration
New counter tops (early March)
New cleanser (mid March)
new safety equipment (early January)
Three 727s
Other Eastern 727s
different flotation devices
new life vests (early January)
NY-Florida (A300)
NY-Chicago (727)
NY-Toronto (727)
Our other A300 routes
Our other 727
Flights over water
No known change
Insert Is/Is Not Pair
Insert Distinction
Insert Change
Notepad
Support
Go to Interview Mode
Previous Screen
Next Screen

Fig. 74

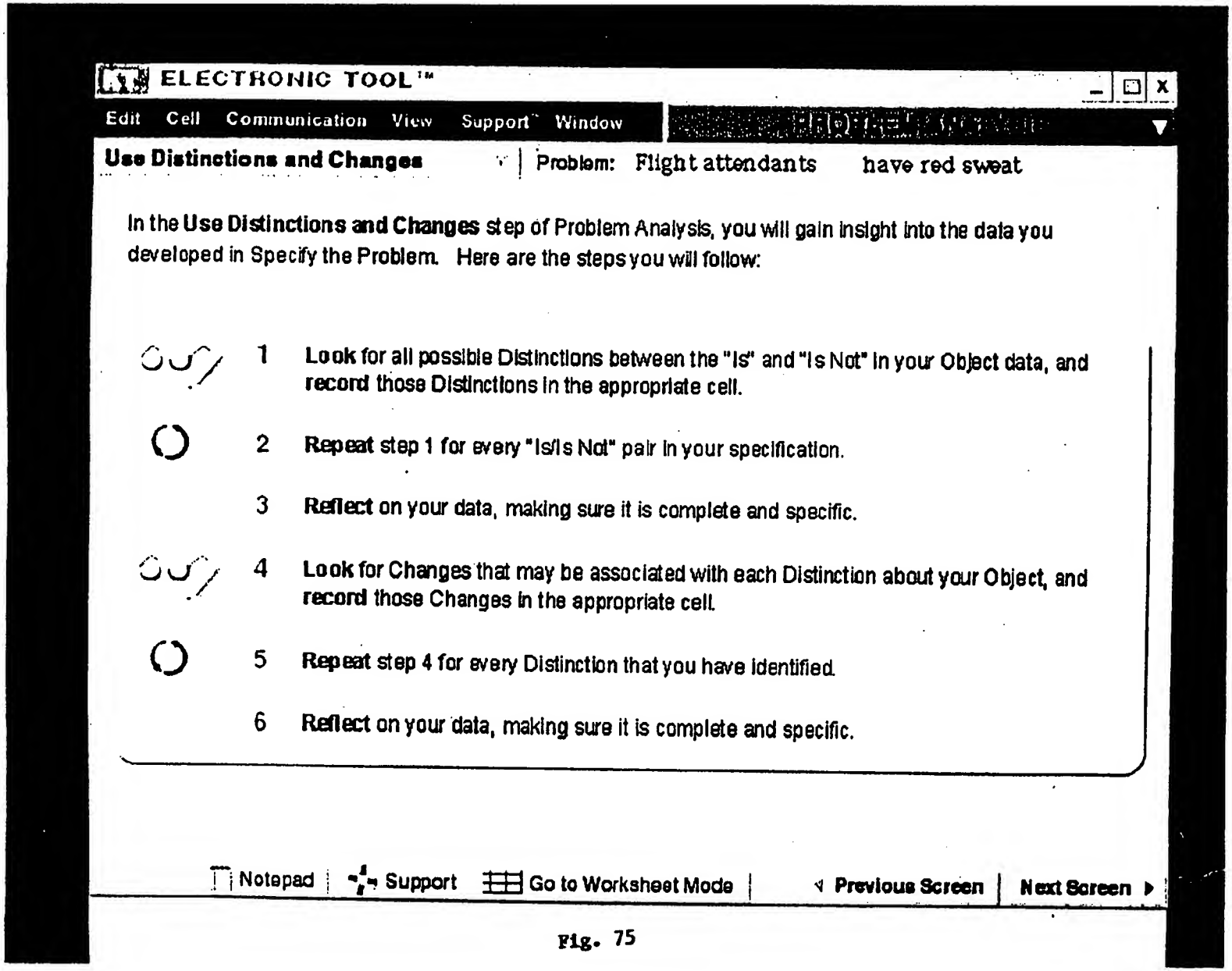

ELECTRONIC TOOL™
Edit Cell Communication View Support Window
Use Distinctions and Changes
Problem: Flight attendants have red sweat
In the Use Distinctions and Changes step of Problem Analysis, you will gain insight into the data you developed in Specify the Problem. Here are the steps you will follow:
1 Look for all possible Distinctions between the "Is" and "Is Not" in your Object data, and record those Distinctions in the appropriate cell.
2 Repeat step 1 for every "Is/Is Not" pair in your specification.
3 Reflect on your data, making sure it is complete and specific.
4 Look for Changes that may be associated with each Distinction about your Object, and record those Changes in the appropriate cell.
5 Repeat step 4 for every Distinction that you have identified.
6 Reflect on your data, making sure it is complete and specific.
Notepad
Support
Go to Worksheet Mode
Previous Screen
Next Screen

Fig. 75

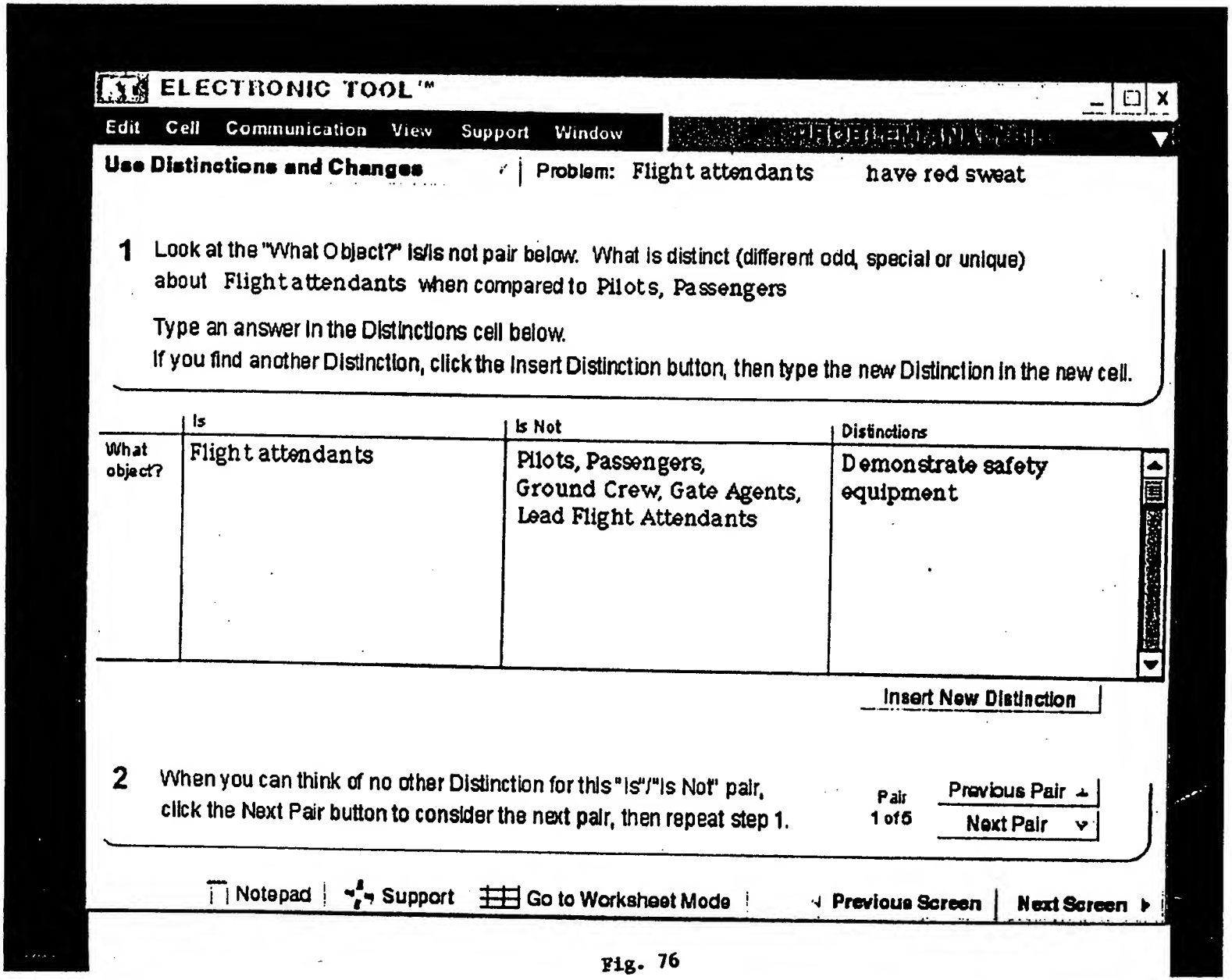

ELECTRONIC TOOL™
Edit Cell Communication View Support Window
Use Distinctions and Changes
Problem: Flight attendants have red sweat
1 Look at the "What Object?" is/is not pair below. What is distinct (different odd, special or unique) about Flight attendants when compared to Pilots, Passengers
Type an answer in the Distinctions cell below.
If you find another Distinction, click the Insert Distinction button, then type the new Distinction in the new cell.
Is
Is Not
Distinctions
What object?
Flight attendants
Pilots, Passengers, Ground Crew, Gate Agents, Lead Flight Attendants
Demonstrate safety equipment
Insert New Distinction
2 When you can think of no other Distinction for this "Is"/"Is Not" pair, click the Next Pair button to consider the next pair, then repeat step 1.
Pair 1 of 5
Previous Pair
Next Pair
Notepad
Support
Go to Worksheet Mode
Previous Screen
Next Screen

Fig. 76

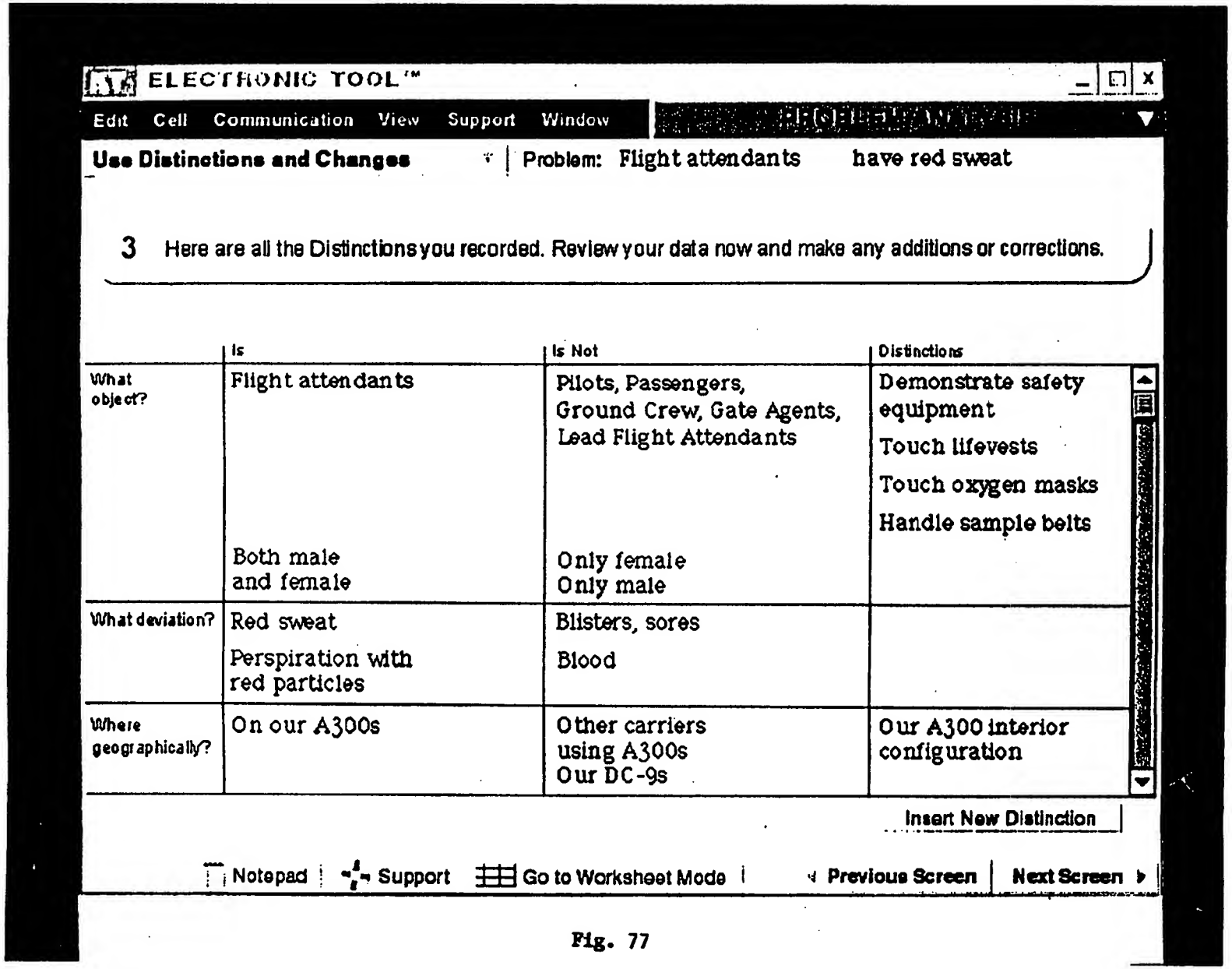

ELECTRONIC TOOL™
Edit Cell Communication View Support Window
Use Distinctions and Changes
Problem: Flight attendants have red sweat
3 Here are all the Distinctions you recorded. Review your data now and make any additions or corrections.
Is
Is Not
Distinctions
What object?
Flight attendants
Both male and female
Pilots, Passengers, Ground Crew, Gate Agents, Lead Flight Attendants
Only female
Only male
Demonstrate safety equipment
Touch lifevests
Touch oxygen masks
Handle sample belts
What deviation?
Red sweat
Perspiration with red particles
Blisters, sores
Blood
Where geographically?
On our A300s
Other carriers using A300s
Our DC-9s
Our A300 interior configuration
Insert New Distinction
Notepad
Support
Go to Worksheet Mode
Previous Screen
Next Screen

Fig. 77

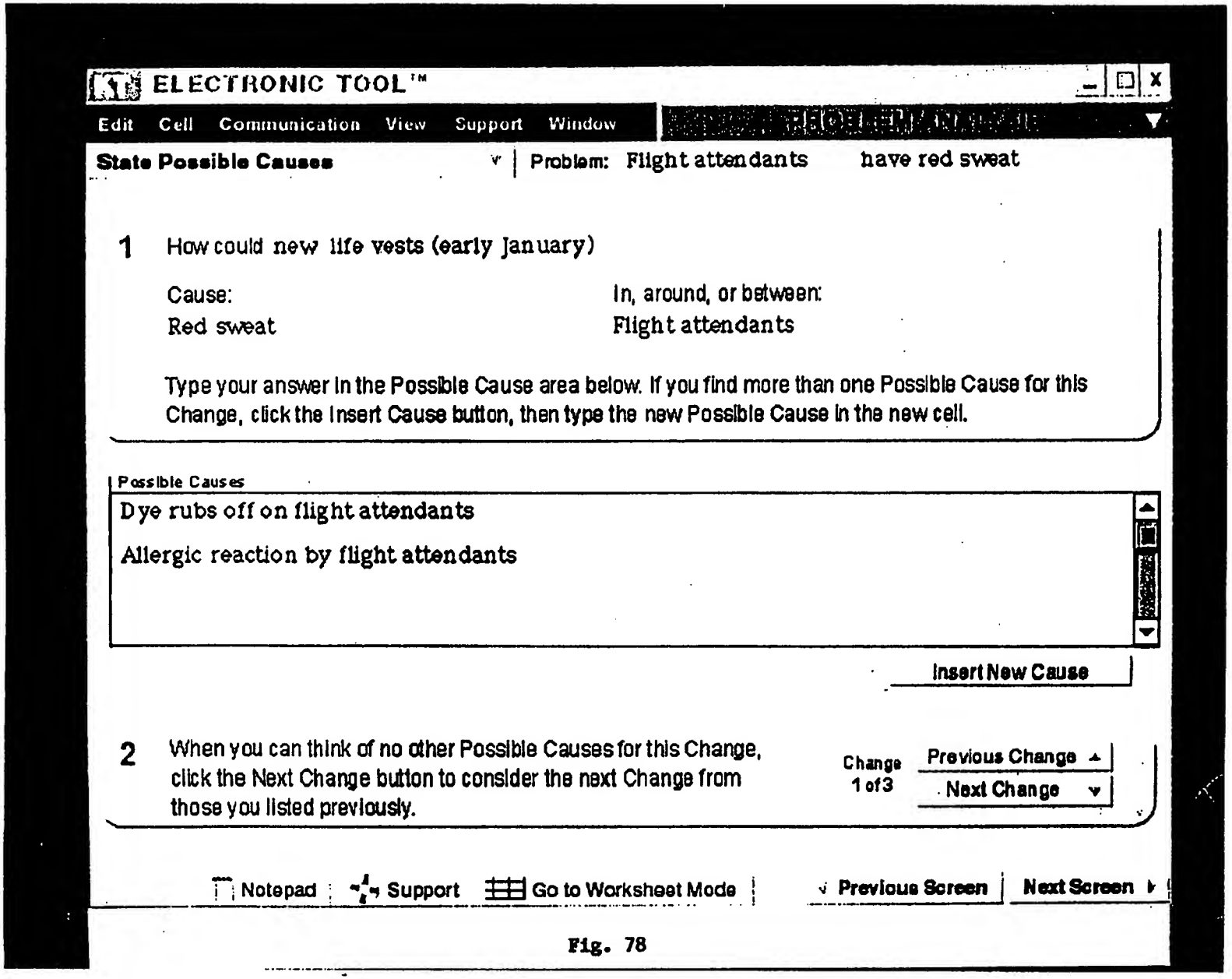

ELECTRONIC TOOL™
Edit Cell Communication View Support Window
State Possible Causes
Problem: Flight attendants have red sweat
1 How could new life vests (early January)
Cause:
Red sweat
In, around, or between:
Flight attendants
Type your answer in the Possible Cause area below. If you find more than one Possible Cause for this Change, click the Insert Cause button, then type the new Possible Cause in the new cell.
Possible Causes
Dye rubs off on flight attendants
Allergic reaction by flight attendants
Insert New Cause
2 When you can think of no other Possible Causes for this Change, click the Next Change button to consider the next Change from those you listed previously.
Change 1 of 3
Previous Change
Next Change
Notepad
Support
Go to Worksheet Mode
Previous Screen
Next Screen

Fig. 78

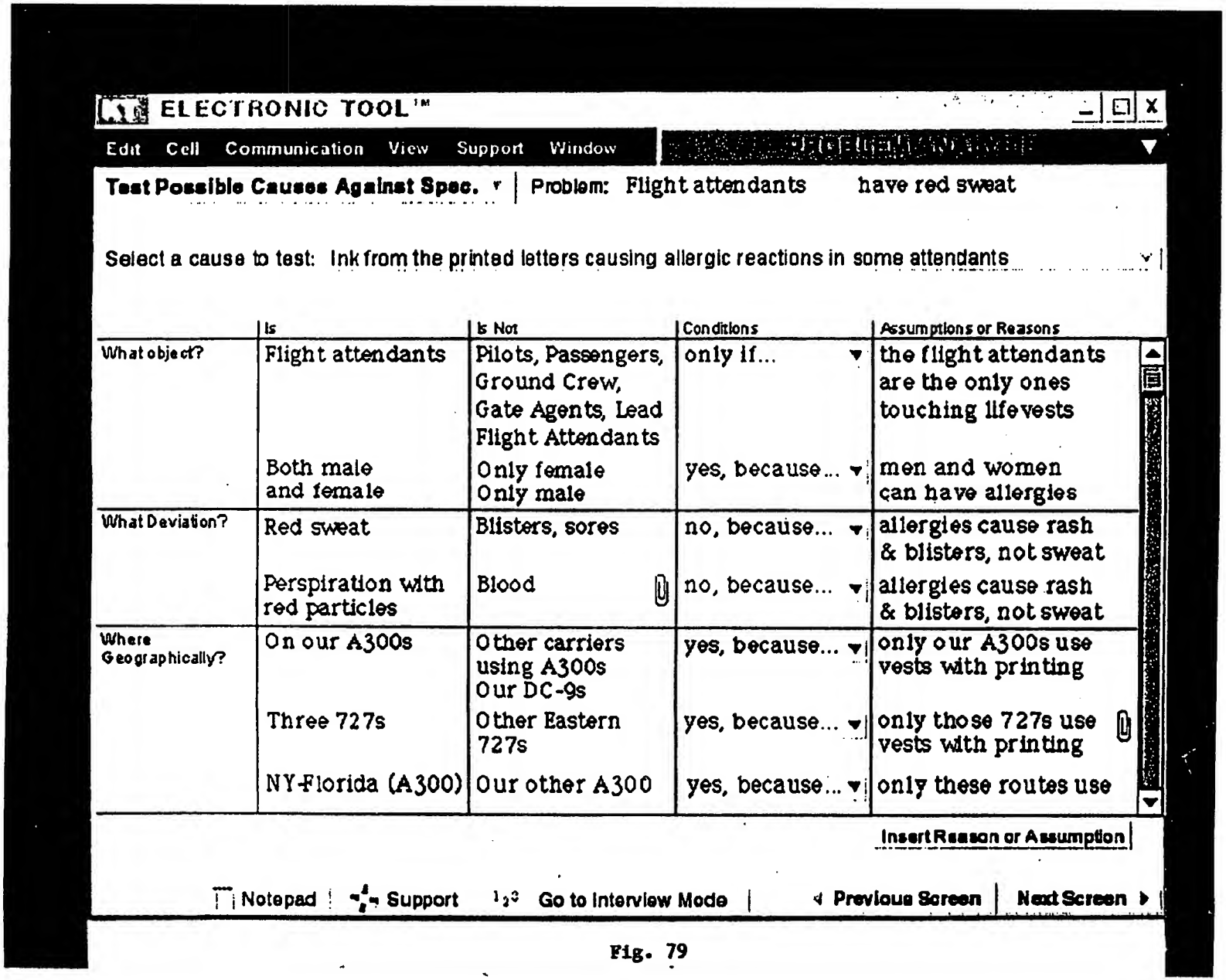

ELECTRONIC TOOL™
Edit Cell Communication View Support Window
Test Possible Causes Against Spec.
Problem: Flight attendants have red sweat
Select a cause to test: Ink from the printed letters causing allergic reactions in some attendants
Is
Is Not
Conditions
Assumptions or Reasons
What object?
Flight attendants
Pilots, Passengers, Ground Crew, Gate Agents, Lead Flight Attendants
only if...
the flight attendants are the only ones touching lifevests
Both male and female
Only female Only male
yes, because...
men and women can have allergies
What Deviation?
Red sweat
Blisters, sores
no, because...
allergies cause rash & blisters, not sweat
Perspiration with red particles
Blood
no, because...
allergies cause rash & blisters, not sweat
Where Geographically?
On our A300s
Other carriers using A300s Our DC-9s
yes, because...
only our A300s use vests with printing
Three 727s
Other Eastern 727s
yes, because...
only those 727s use vests with printing
NY-Florida (A300)
Our other A300
yes, because...
only these routes use
Insert Reason or Assumption
Notepad
Support
Go to Interview Mode
Previous Screen
Next Screen

Fig. 79

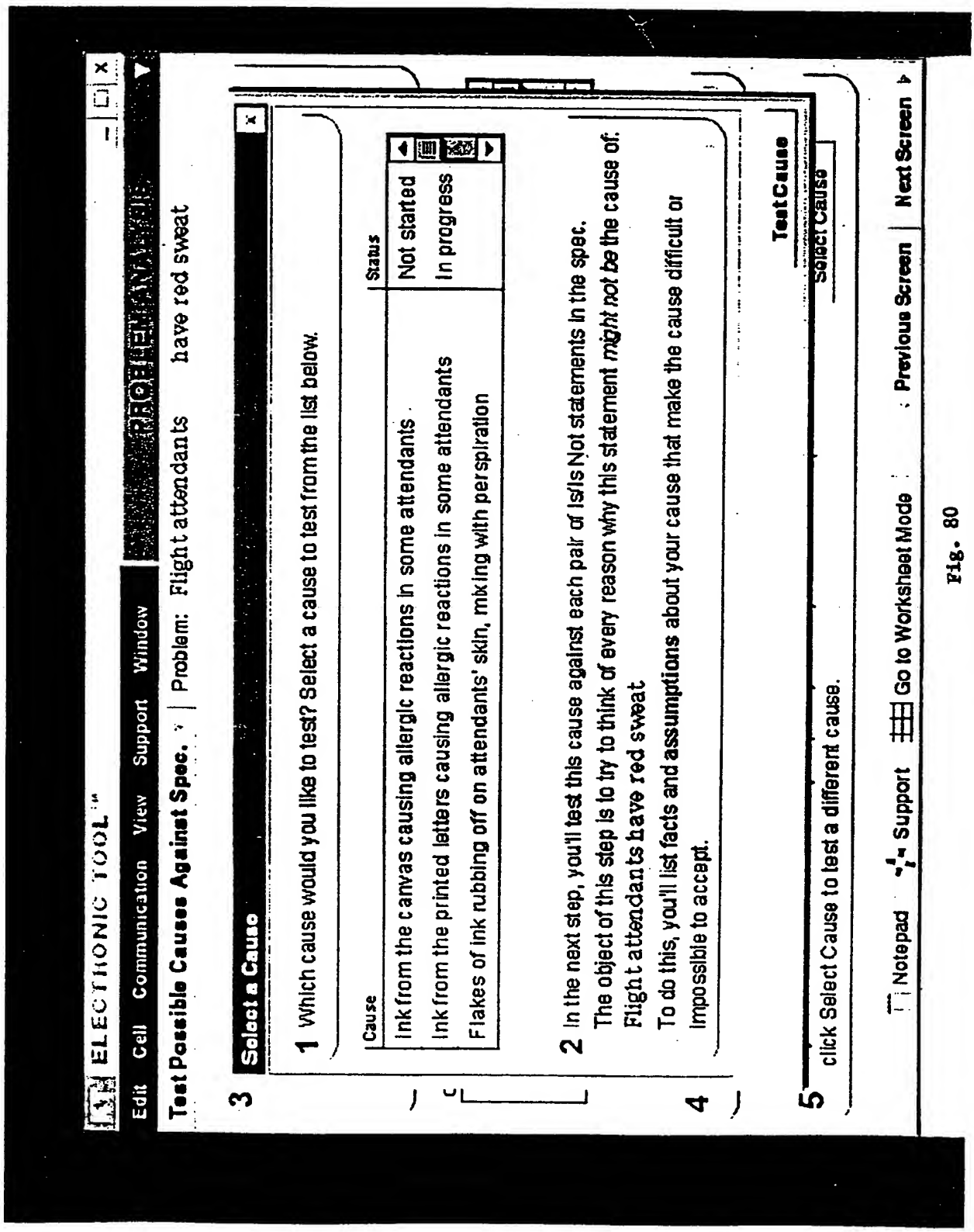

ELECTRONIC TOOL
Edit Cell Communication View Support Window
Test Possible Causes Against Spec. | Problem: Flight attendants have red sweat
3
Select a Cause
1 Which cause would you like to test? Select a cause to test from the list below.
Cause
Status
Ink from the canvas causing allergic reactions in some attendants
Not started
Ink from the printed letters causing allergic reactions in some attendants
In progress
Flakes of ink rubbing off on attendants' skin, mixing with perspiration
2 In the next step, you'll test this cause against each pair of Is/Is Not statements in the spec.
The object of this step is to try to think of every reason why this statement might not be the cause of:
Flight attendants have red sweat
To do this, you'll list facts and assumptions about your cause that make the cause difficult or impossible to accept.
4
Test Cause
5
click Select Cause to test a different cause.
Select Cause
Notepad
Support
Go to Worksheet Mode
Previous Screen
Next Screen

Fig. 80

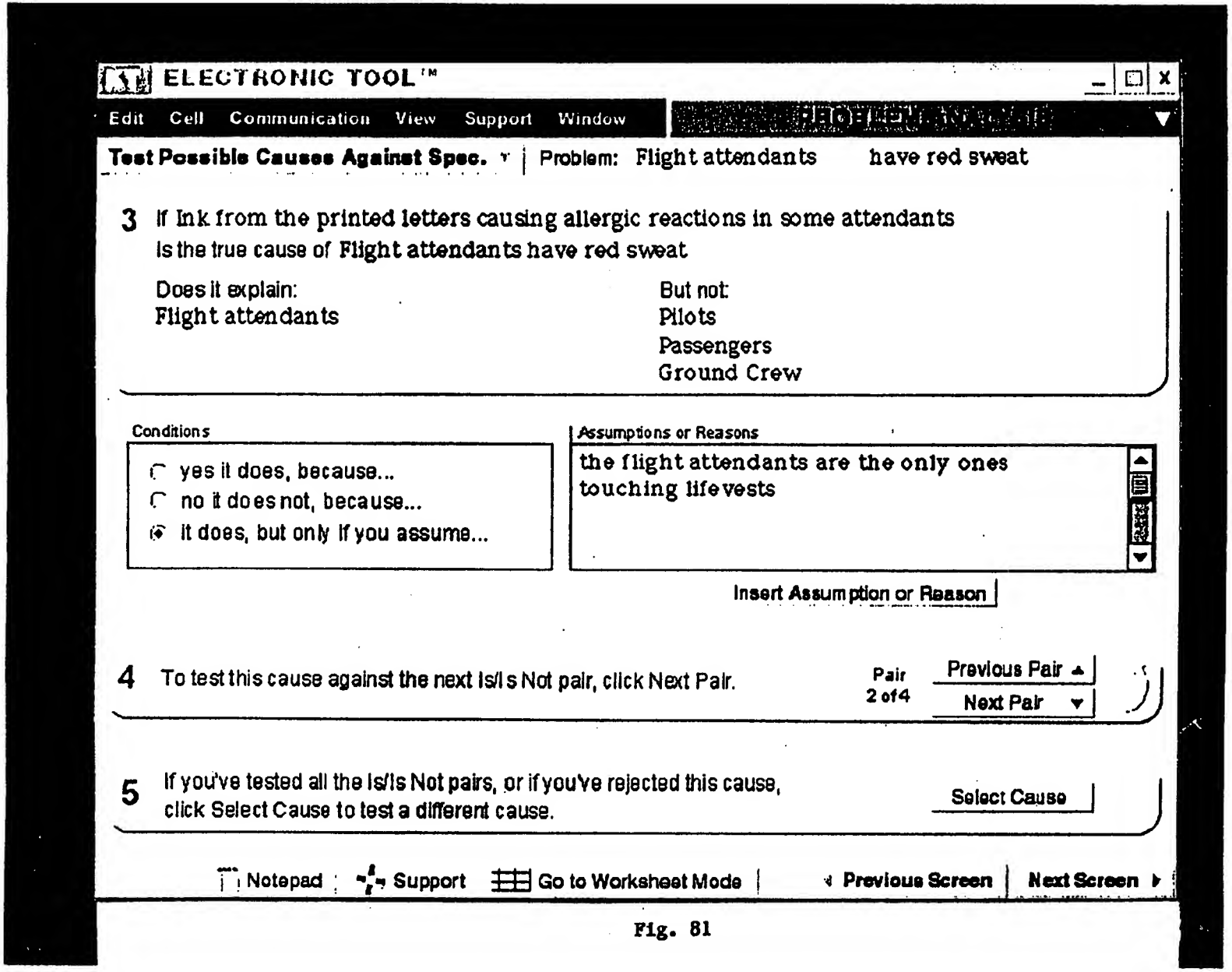

ELECTRONIC TOOL™
Edit Cell Communication View Support Window
Test Possible Causes Against Spec.
Problem: Flight attendants have red sweat
3 If Ink from the printed letters causing allergic reactions in some attendants is the true cause of Flight attendants have red sweat
Does it explain:
Flight attendants
But not:
Pilots
Passengers
Ground Crew
Conditions
yes it does, because...
no it does not, because...
it does, but only if you assume...
Assumptions or Reasons
the flight attendants are the only ones touching lifevests
Insert Assumption or Reason
4 To test this cause against the next Is/Is Not pair, click Next Pair.
Pair 2 of 4
Previous Pair
Next Pair
5 If you've tested all the Is/Is Not pairs, or if you've rejected this cause, click Select Cause to test a different cause.
Select Cause
Notepad
Support
Go to Worksheet Mode
Previous Screen
Next Screen

Fig. 81

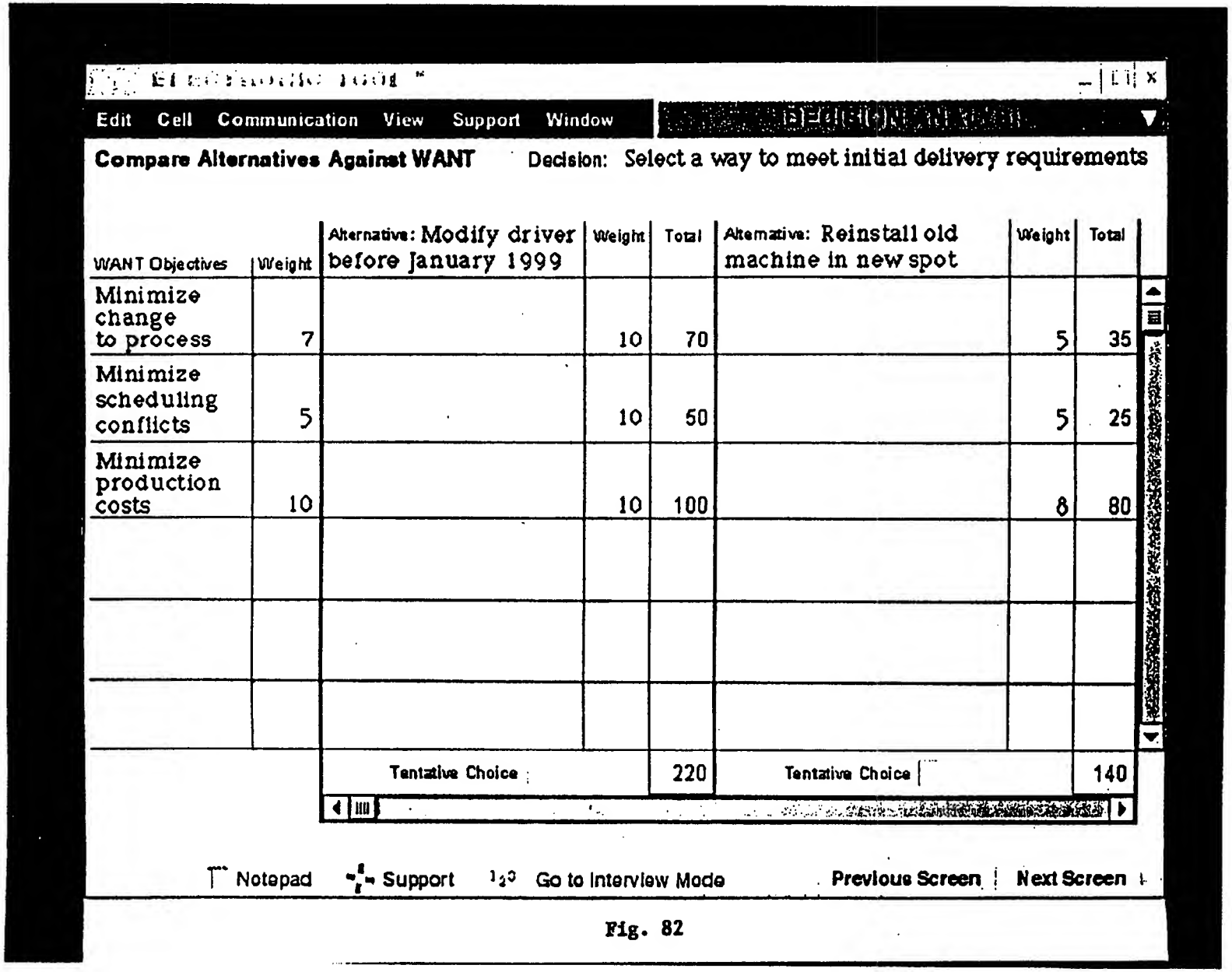

Edit Cell Communication View Support Window
Compare Alternatives Against WANT
Decision: Select a way to meet initial delivery requirements
WANT Objectives
Weight
Alternative: Modify driver before January 1999
Weight
Total
Alternative: Reinstall old machine in new spot
Weight
Total
Minimize change to process
7
10
70
5
35
Minimize scheduling conflicts
5
10
50
5
25
Minimize production costs
10
10
100
8
80
Tentative Choice
220
Tentative Choice
140
Notepad
Support
Go to Interview Mode
Previous Screen
Next Screen

Fig. 82

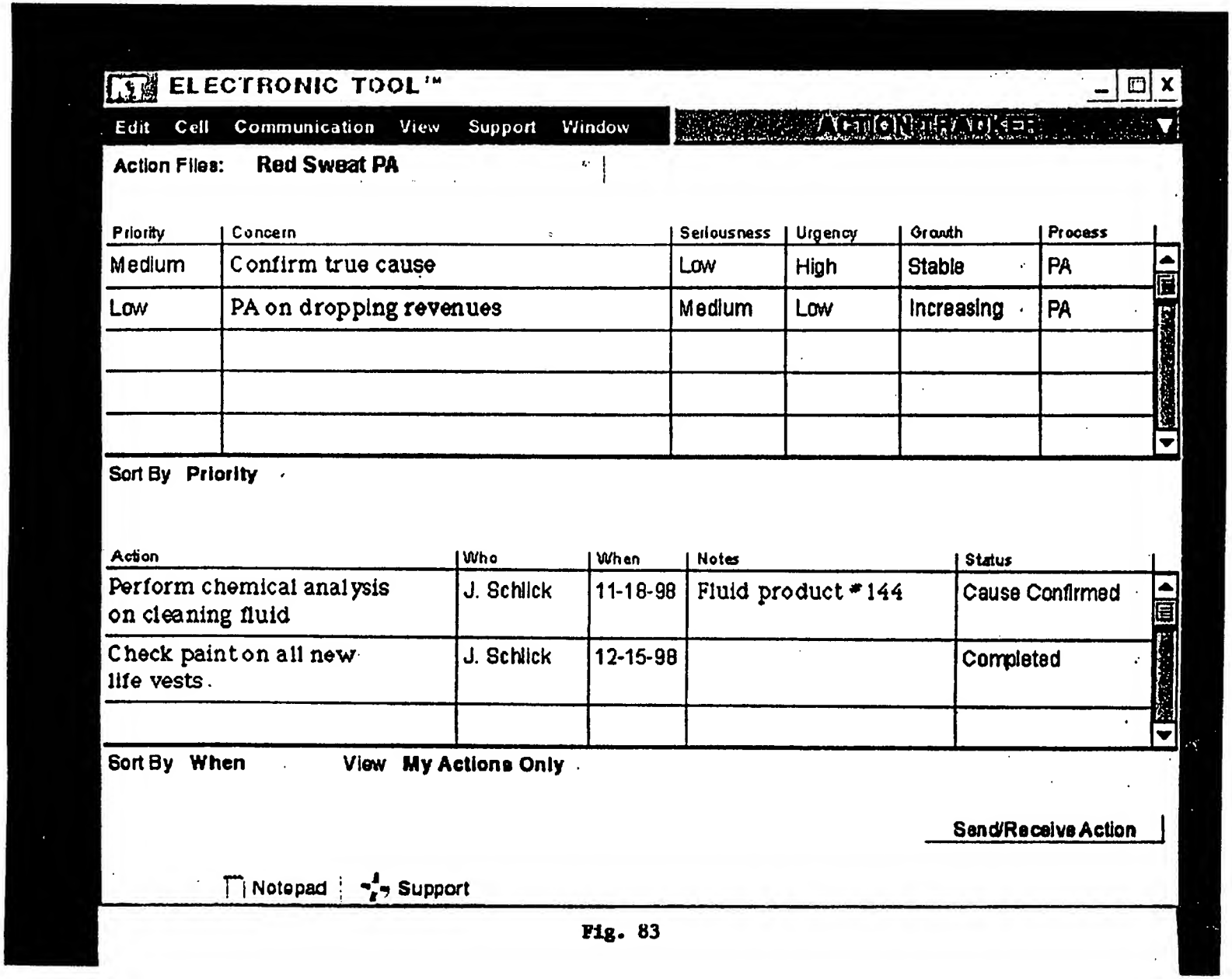

ELECTRONIC TOOL™
Edit Cell Communication View Support Window
Action Files: Red Sweat PA
Priority | Concern | Seriousness | Urgency | Growth | Process
Medium | Confirm true cause | Low | High | Stable | PA
Low | PA on dropping revenues | Medium | Low | Increasing | PA
Sort By Priority
Action | Who | When | Notes | Status
Perform chemical analysis on cleaning fluid | J. Schlick | 11-18-98 | Fluid product #144 | Cause Confirmed
Check paint on all new life vests. | J. Schlick | 12-15-98 | | Completed
Sort By When View My Actions Only
Send/Receive Action
Notepad
Support

Fig. 83

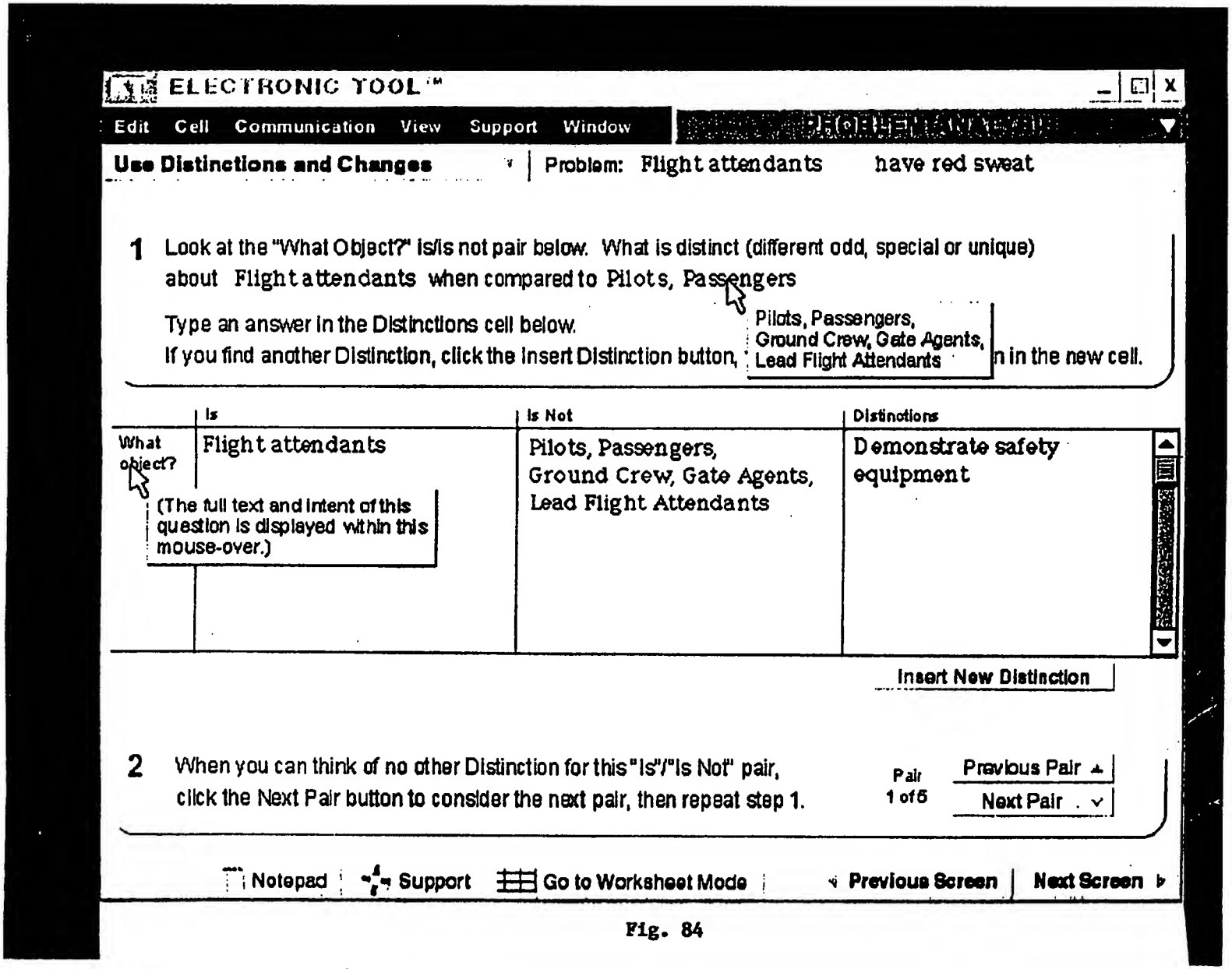

ELECTRONIC TOOL™
Edit Cell Communication View Support Window
Use Distinctions and Changes
Problem: Flight attendants have red sweat
1 Look at the "What Object?" is/is not pair below. What is distinct (different odd, special or unique) about Flight attendants when compared to Pilots, Passengers
Type an answer in the Distinctions cell below.
If you find another Distinction, click the Insert Distinction button,
Pilots, Passengers, Ground Crew, Gate Agents, Lead Flight Attendants
n in the new cell.
Is
Is Not
Distinctions
What object?
Flight attendants
Pilots, Passengers, Ground Crew, Gate Agents, Lead Flight Attendants
Demonstrate safety equipment
(The full text and intent of this question is displayed within this mouse-over.)
Insert New Distinction
2 When you can think of no other Distinction for this "Is"/"Is Not" pair, click the Next Pair button to consider the next pair, then repeat step 1.
Pair 1 of 5
Previous Pair
Next Pair
Notepad
Support
Go to Worksheet Mode
Previous Screen
Next Screen

Fig. 84

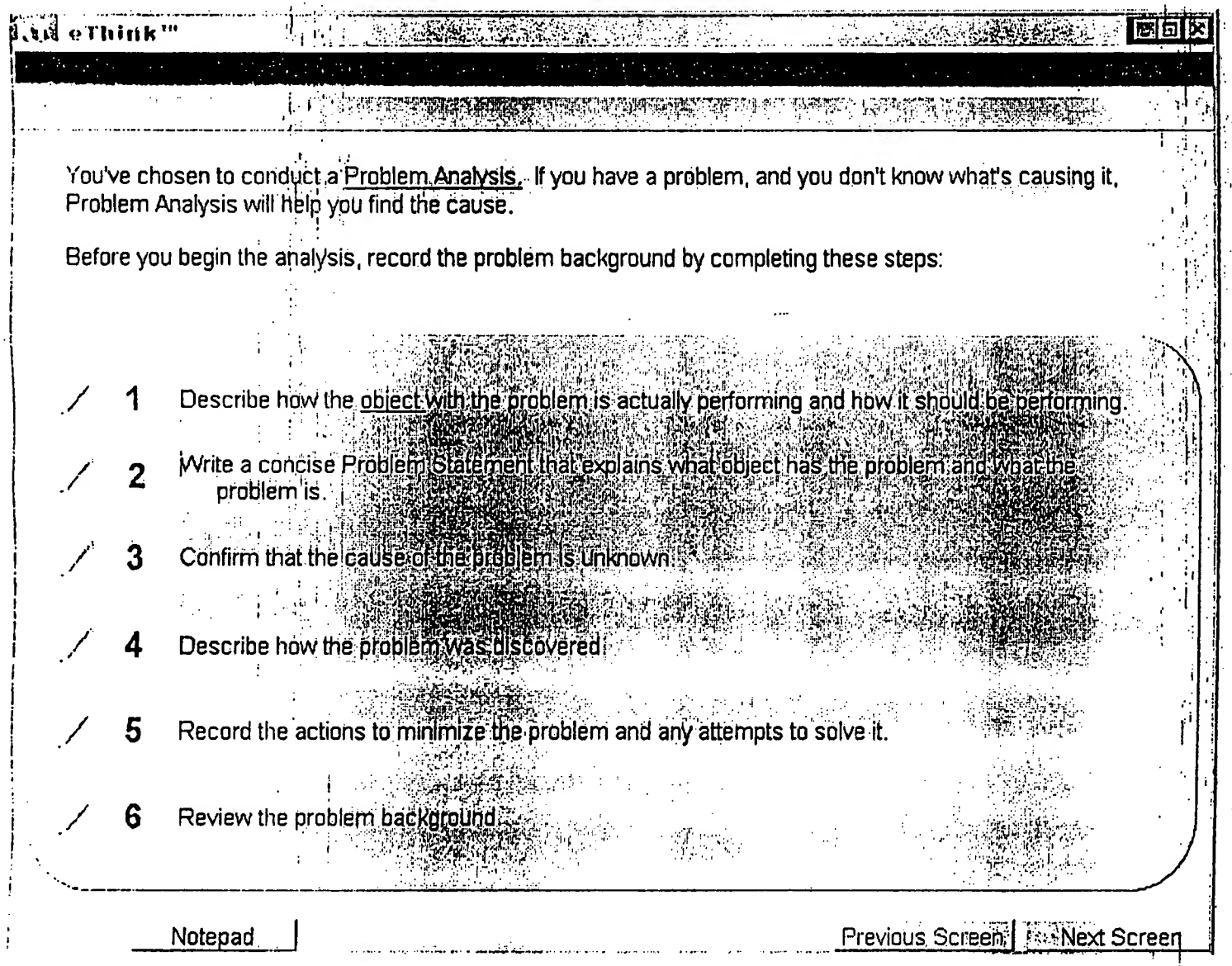

eThink™
You've chosen to conduct a Problem Analysis. If you have a problem, and you don't know what's causing it, Problem Analysis will help you find the cause.
Before you begin the analysis, record the problem background by completing these steps:
1 Describe how the object with the problem is actually performing and how it should be performing.
2 Write a concise Problem Statement that explains what object has the problem and what the problem is.
3 Confirm that the cause of the problem is unknown.
4 Describe how the problem was discovered.
5 Record the actions to minimize the problem and any attempts to solve it.
6 Review the problem background.
Notepad
Previous Screen
Next Screen

Fig. 85

eThink
1a How is the person processing/thinking/will the problem actually get solved?
Actual:
1b How should the person processing/thinking/will the problem get solved?
Should:
Notepad
Previous Screen
Next Screen

Fig. 86

eThink
Refer to your Should and Actual information to answer the following questions.
Should:
Actual:
2a
Object:
2b
Deviation:
Your Problem Statement
Problem Statement
Notepad
Previous Screen
Next Screen

Fig. 87

Think
3 Do you know what's causing
No, I'm not certain. Continue the RAT
Yes, but I need to choose a way to fix it
Yes, but I need to make a plan for fixing it
Yes, but I can't fix it until I find out what's causing the problem
Yes, but I want to continue this RAT another way
Notepad
Previous Screen
Next Screen

Fig. 88

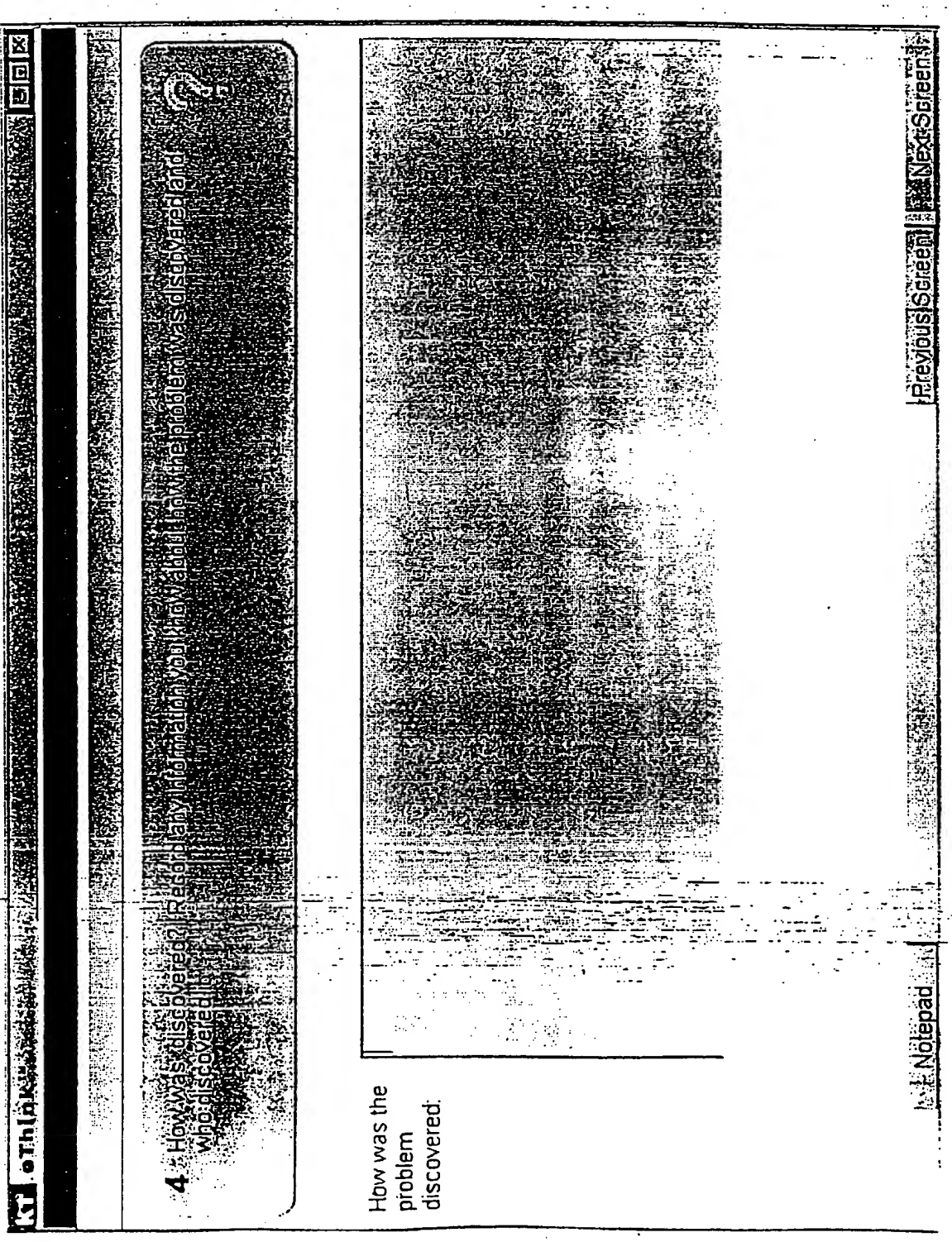

eThink
4. How was discovered? Regarding any information you know about how the problem was discovered and who discovered it.
How was the problem discovered:
Notepad
Previous Screen
Next Screen

Fig. 89

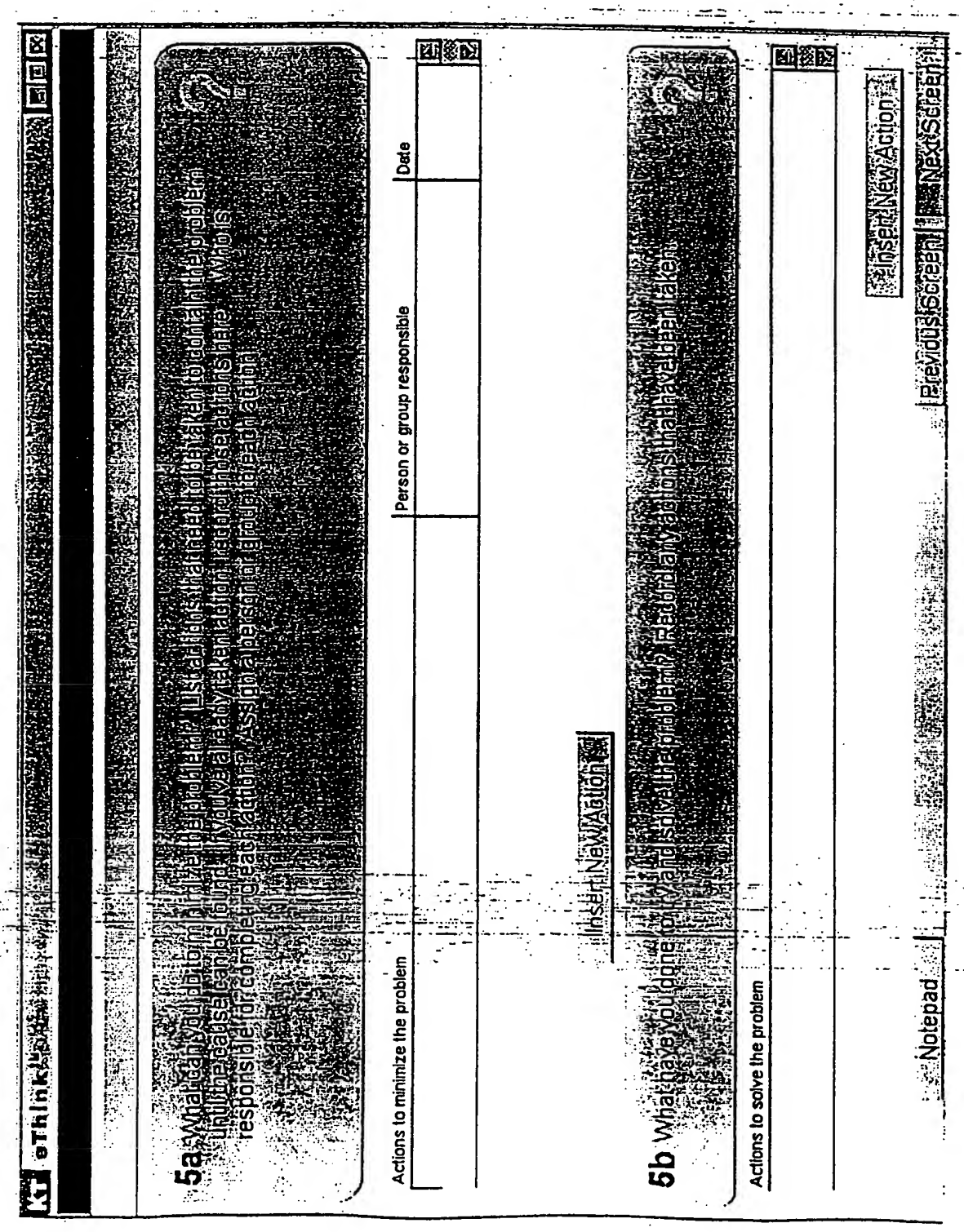

eThink
5a
Person or group responsible
Date
Insert New Action
5b
Actions to solve the problem
Insert New Action
Previous Screen
Next Screen
Notepad

Fig. 90

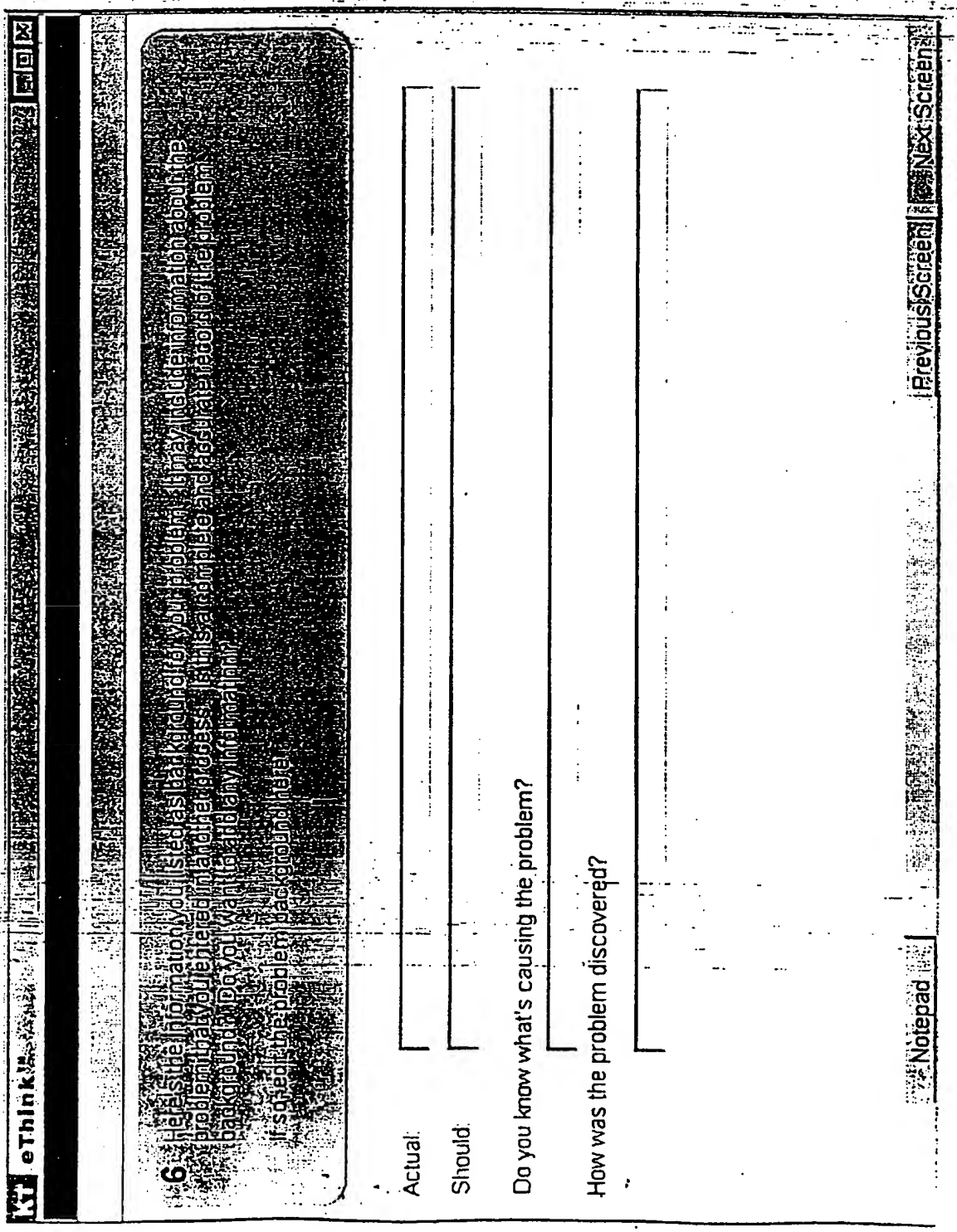

eThink
Actual:
Should:
Do you know what's causing the problem?
How was the problem discovered?
Notepad
Previous Screen
Next Screen

Fig. 91

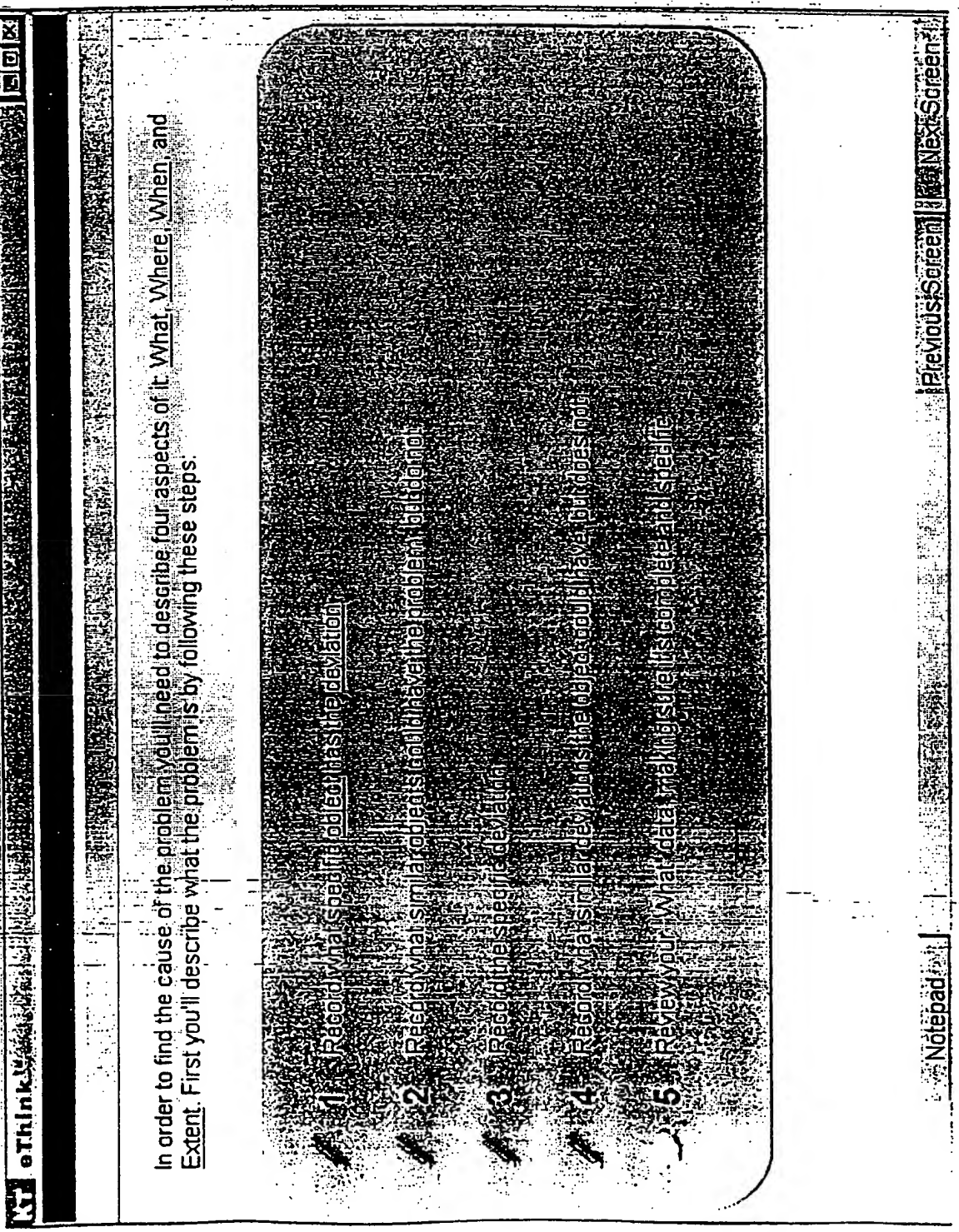

eThink
In order to find the cause of the problem you'll need to describe four aspects of it: What, Where, When, and Extent. First you'll describe what the problem is by following these steps:
1 Record what Specific object has the deviation
2 Record what similar objects could have the problem but do not
3 Record the Specific deviation
4 Record what similar deviations the object could have but does not
5 Review your What data making sure it's complete and specific
Notepad
Previous Screen
Next Screen

Fig. 92

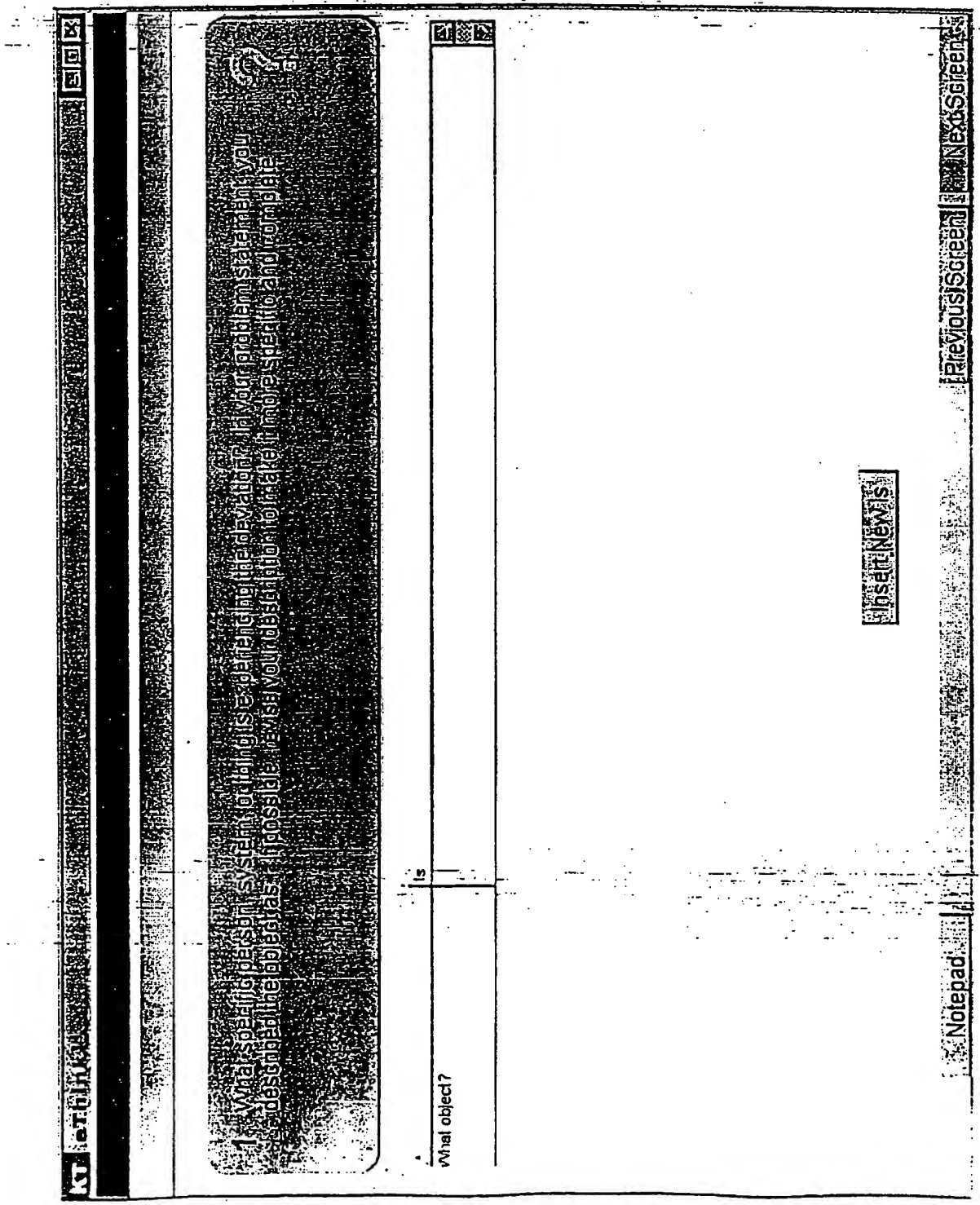


Fig. 93

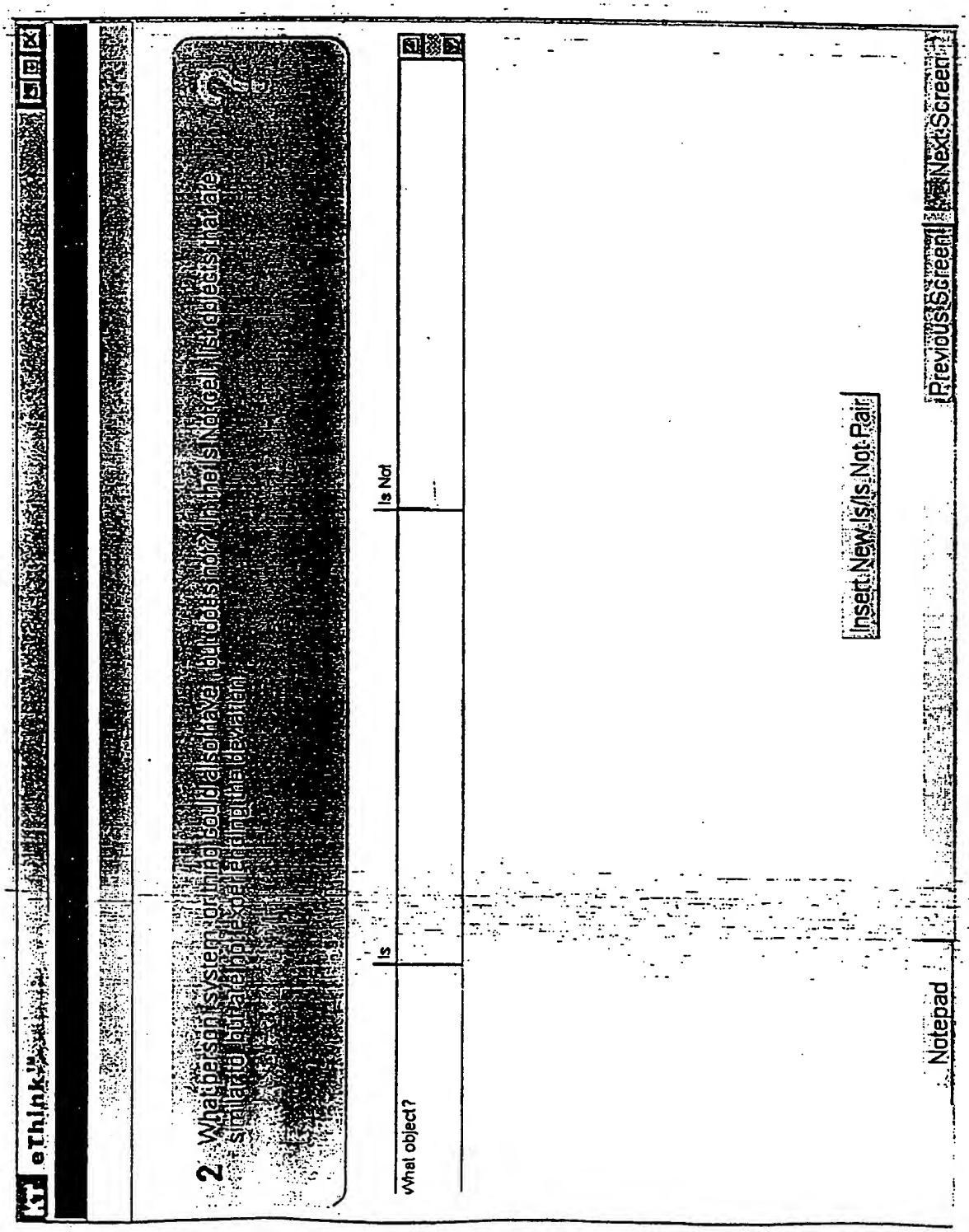

eThink
2
What object?
Is
Is Not
Insert New Is/Is Not Pair
Previous Screen
Next Screen
Notepad

Fig. 94

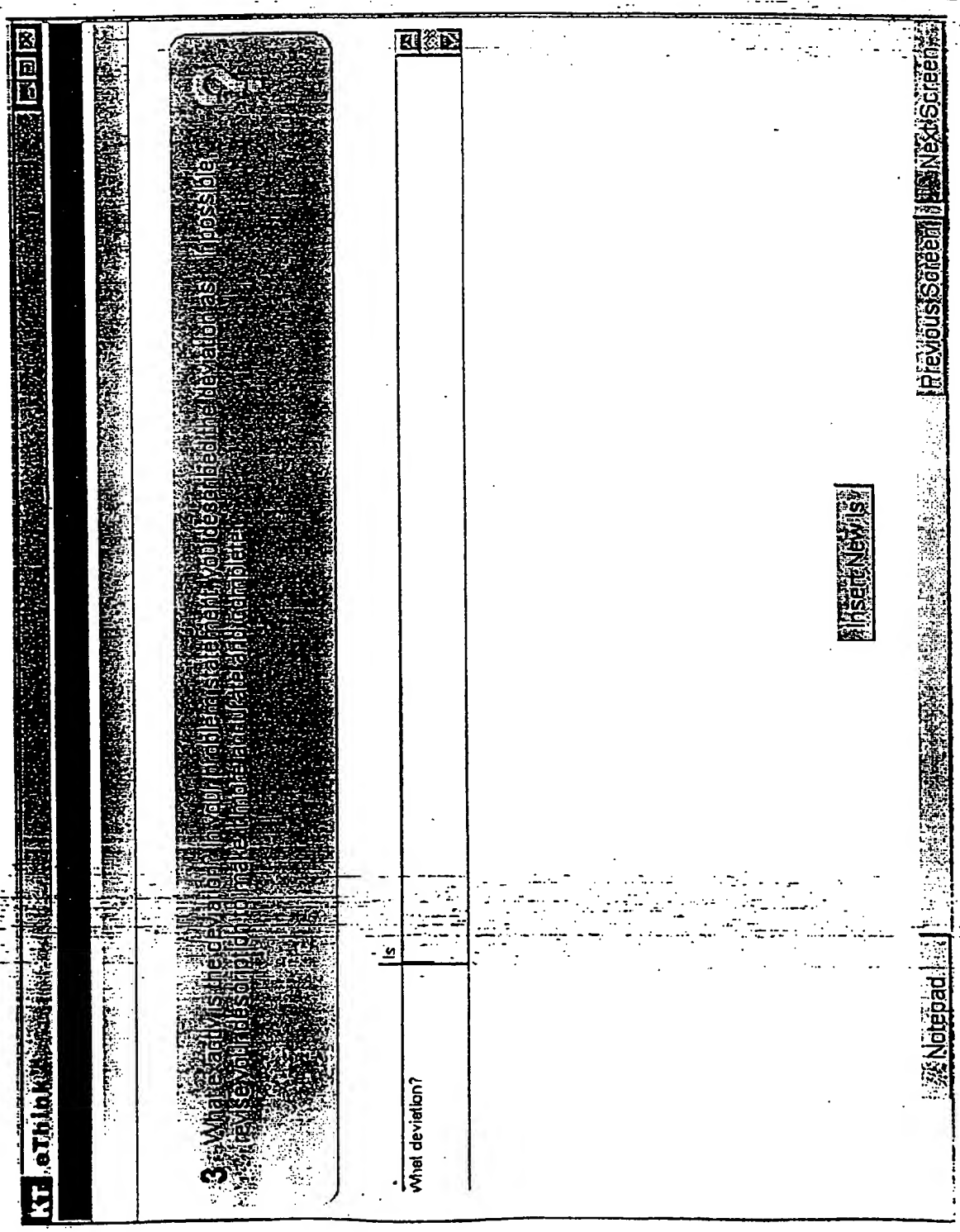

KT eThink
3. What deviation?
Is
What deviation?
Insert New Is?
Notepad
PreviousScreen
NextScreen

Fig. 95

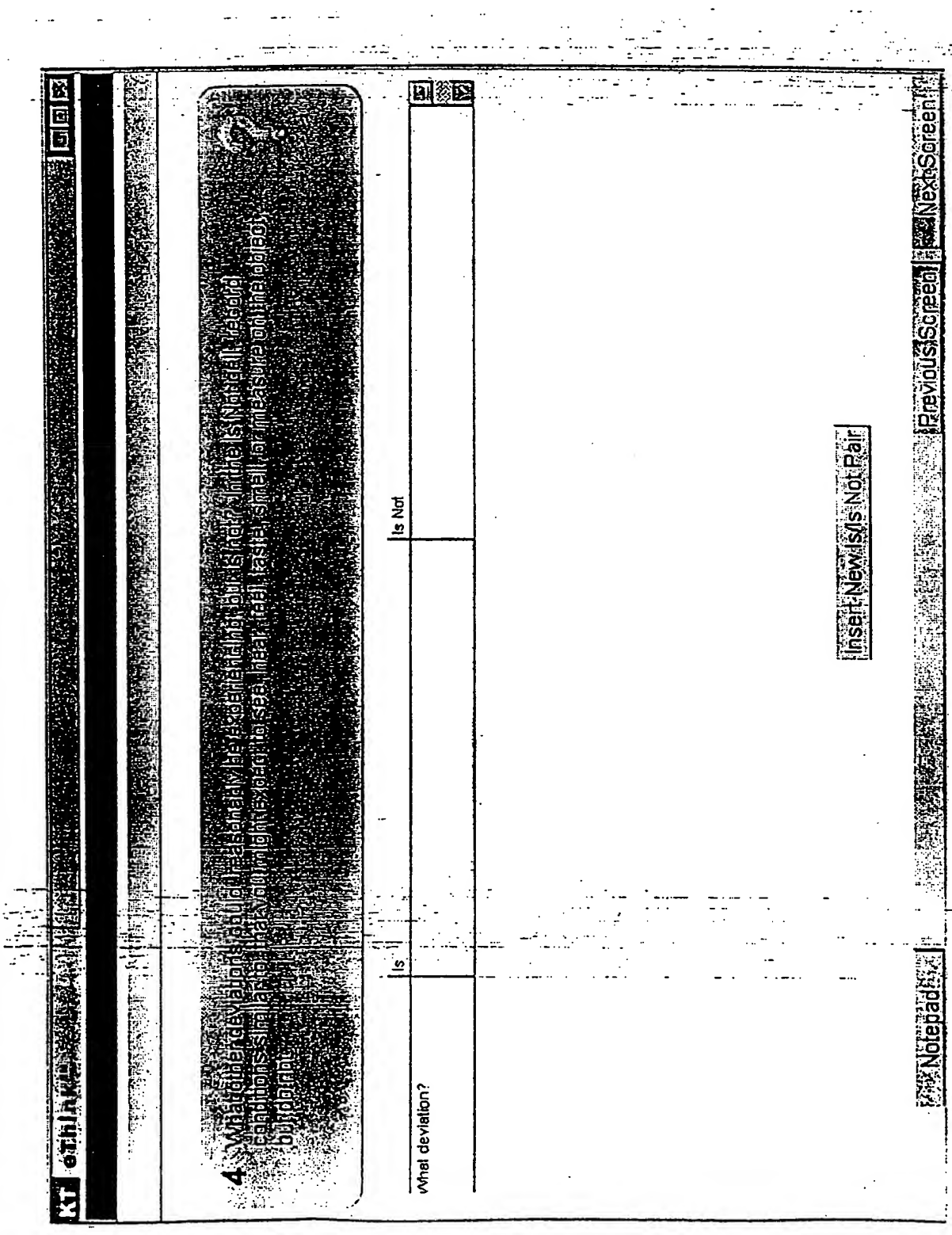

eThink
Is Not
What deviation?
Insert New Is/Is Not Pair
Notepad
Previous Screen
Next Screen

Fig. 96

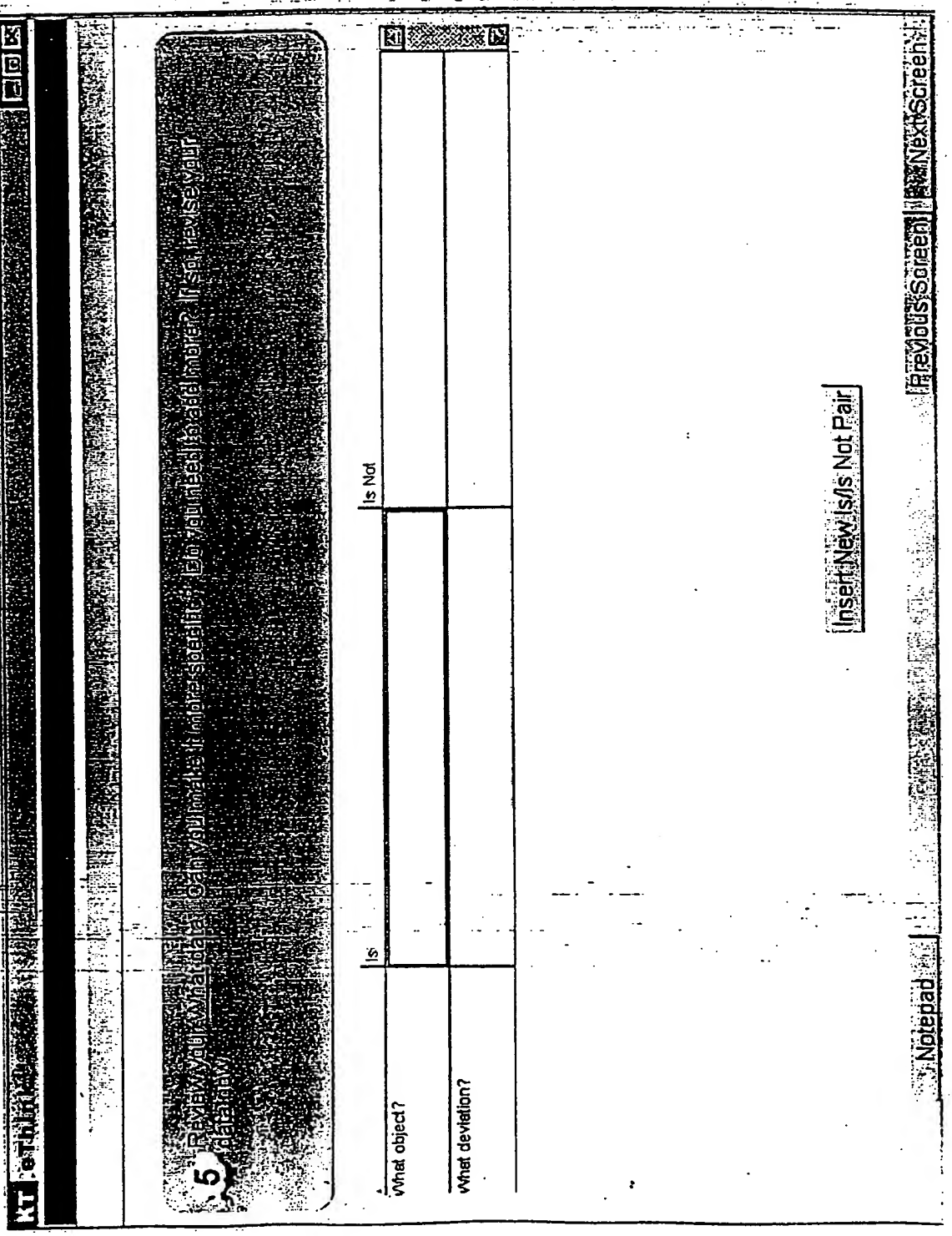

Review Your Work
Is
Is Not
What object?
What deviation?
Insert New Is/Is Not Pair
Previous Screen
Next Screen
Notepad

Fig. 97

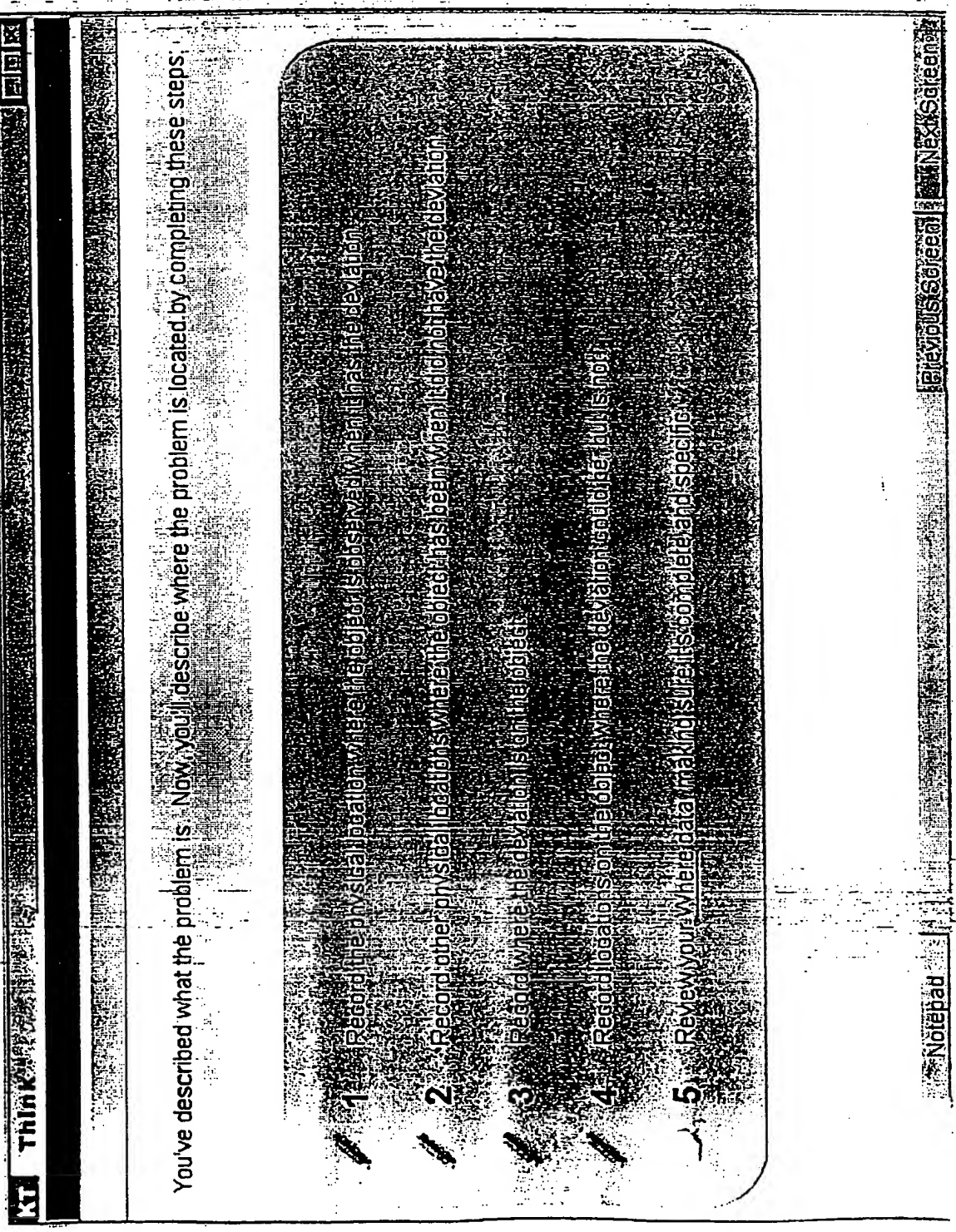

KT ThinK
You've described what the problem is. Now, you'll describe where the problem is located by completing these steps:
1. Record the physical location where the object is observed when it has the deviation.
2. Record other physical locations where the object has been when it did not have the deviation.
3. Record where the deviation is on the object.
4. Record locations on the object where the deviation could be found but is not.
5. Review your Where data making sure it is considered and specific.
Notepad
Previous Screen
Next Screen

Fig. 98

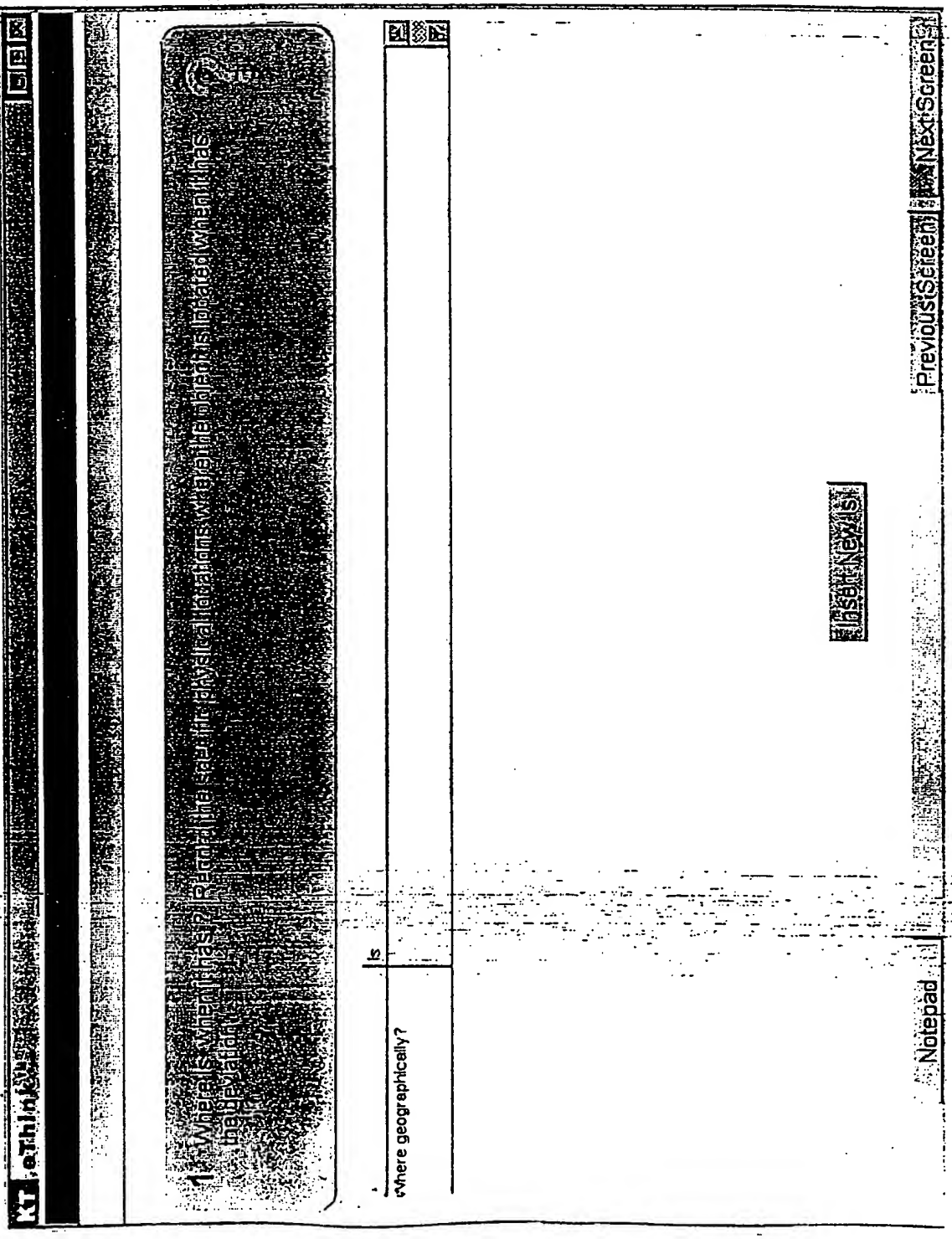

Where geographically?
Is
Notepad
Insert New Item
Previous Screen
Next Screen

Fig. 99

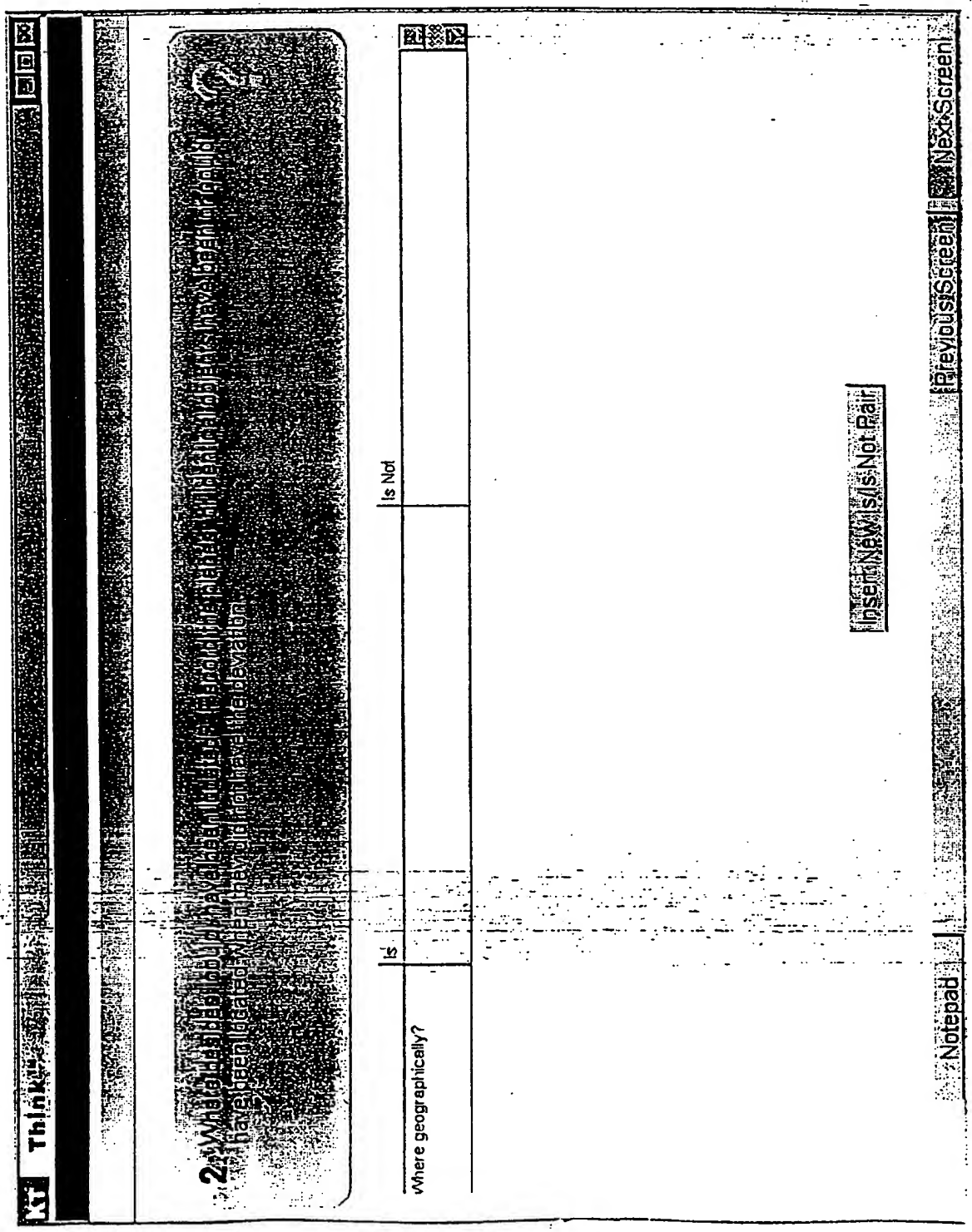

Is
Is Not
Where geographically?
Insert New Is/Is Not Pair
Notepad
Previous Screen
Next Screen

Fig. 100

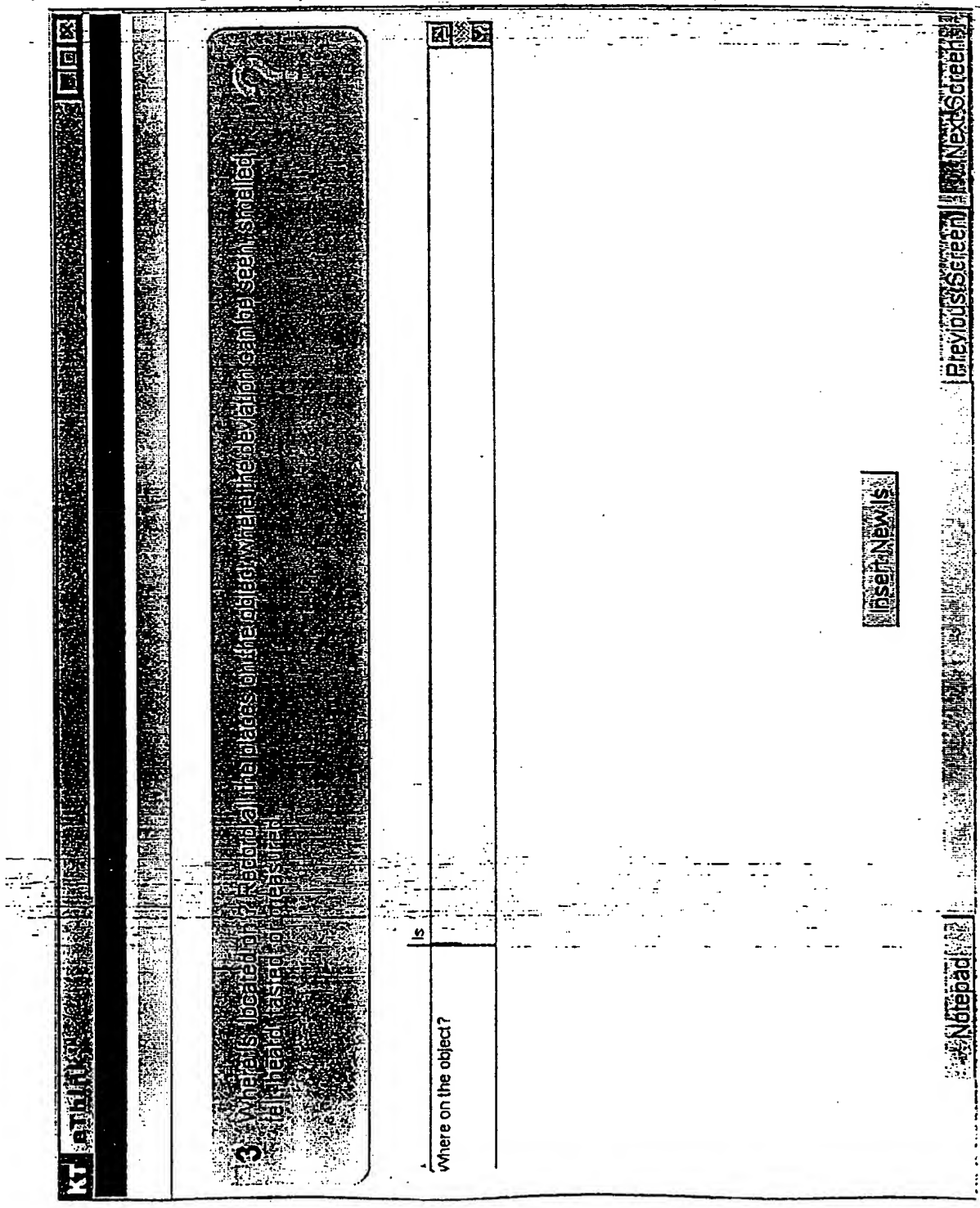

Where on the object?
Is
Insert New Is
Previous Screen
Next Screen
Notepad

Fig. 101

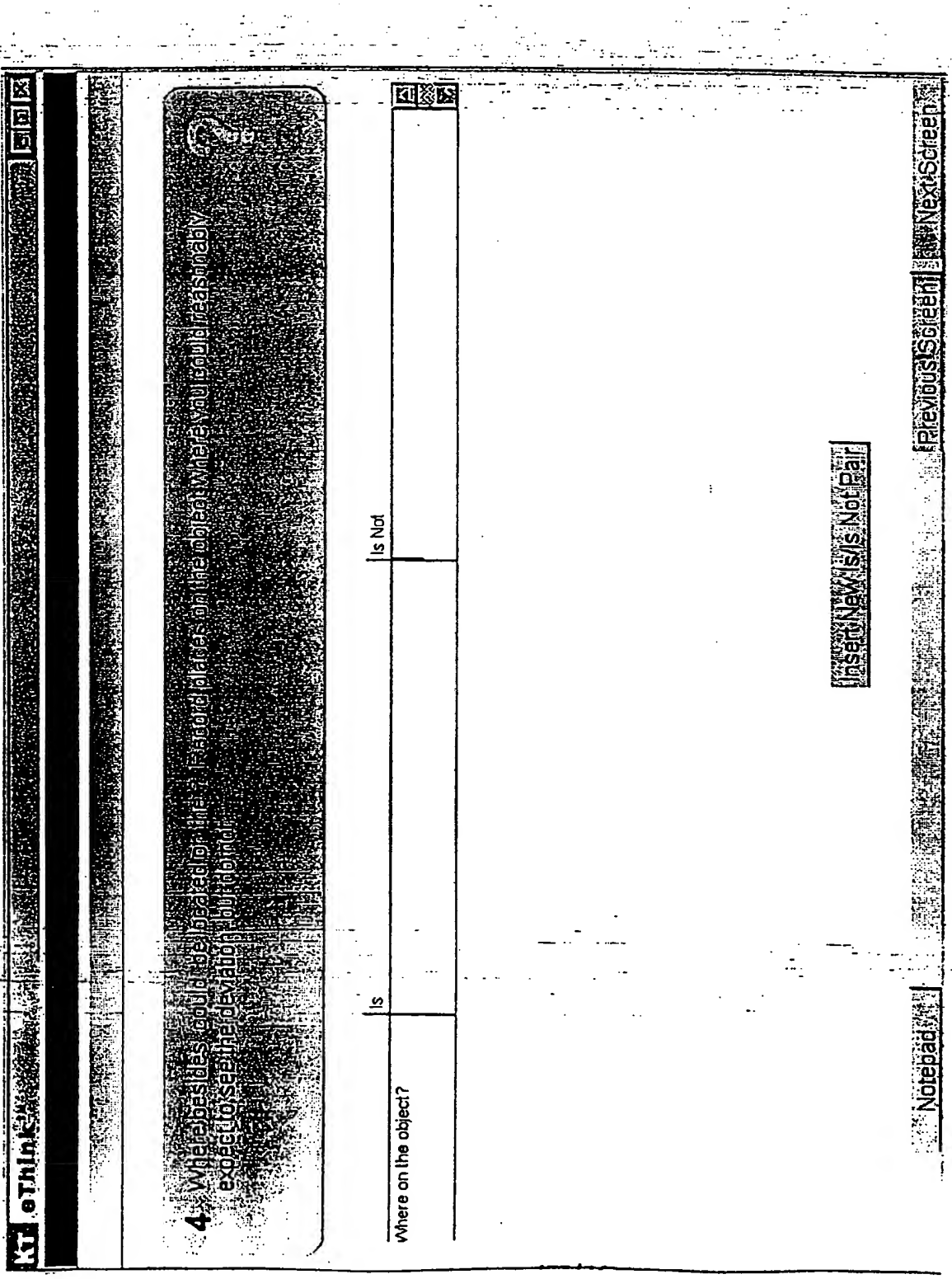

KT eThink
4. Where does it look like it could be located on the object where you could reasonably expect to see the deviation but it doesn't?
Is
Is Not
Where on the object?
Insert New Is/Is Not Pair
Notepad
Previous Screen
Next Screen

Fig. 102

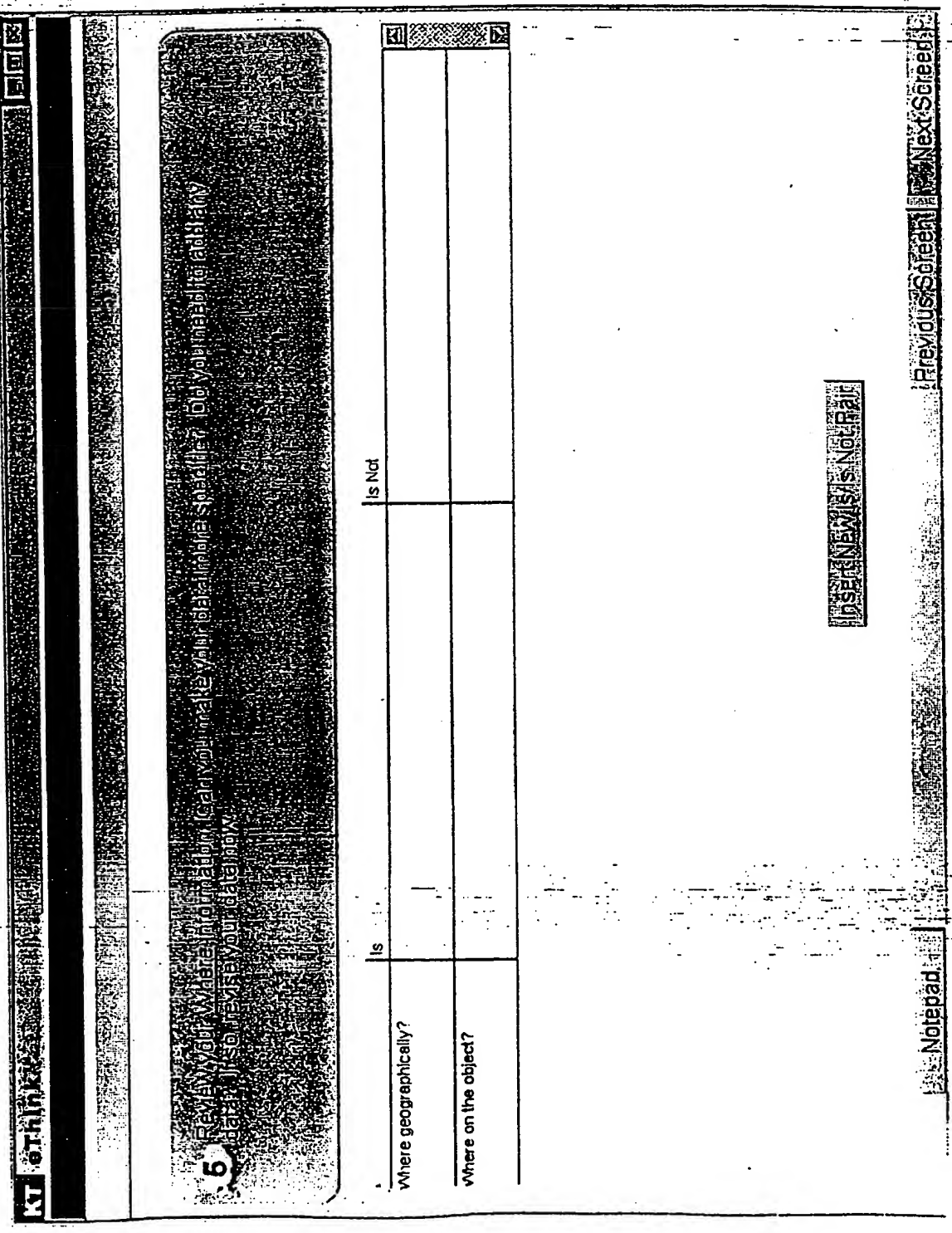

KT eThink
5
Is
Is Not
Where geographically?
Where on the object?
Insert New Is/Is Not Pair
Notepad
Previous Screen
Next Screen

Fig. 103

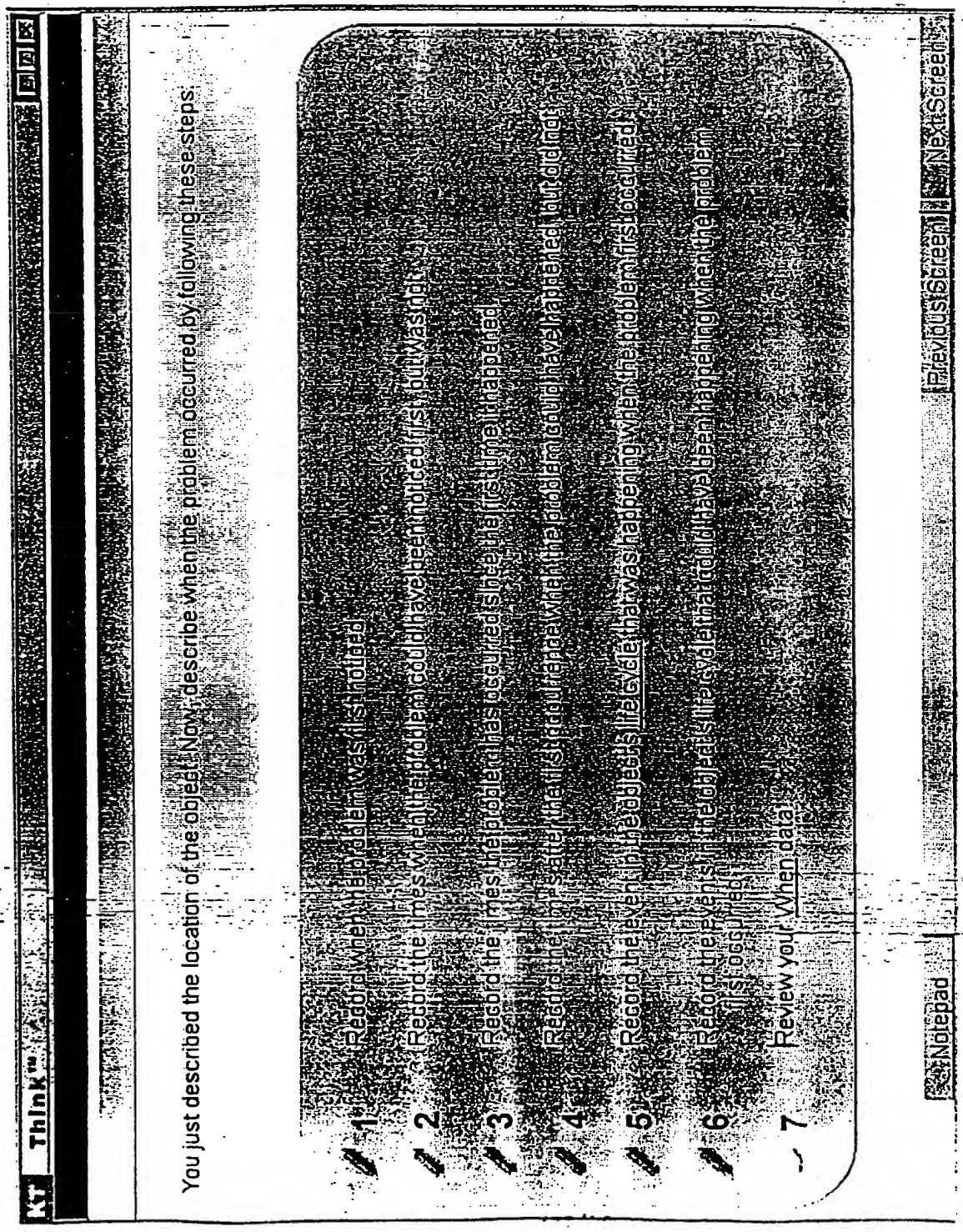

KT Think™
You just described the location of the object. Now, describe when the problem occurred by following these steps:
1. Record when the problem was first noticed
2. Record the times when the problem could have been noticed first but was not
3. Record the times the problem has occurred since the first time it happened
4. Record the time at which the problem would have happened but did not
5. Record the events that were happening when the problem first occurred
6. Record the events in the object that would have been happening when the problem
7. Review your When data
Notepad
Previous Screen
Next Screen

Fig. 104

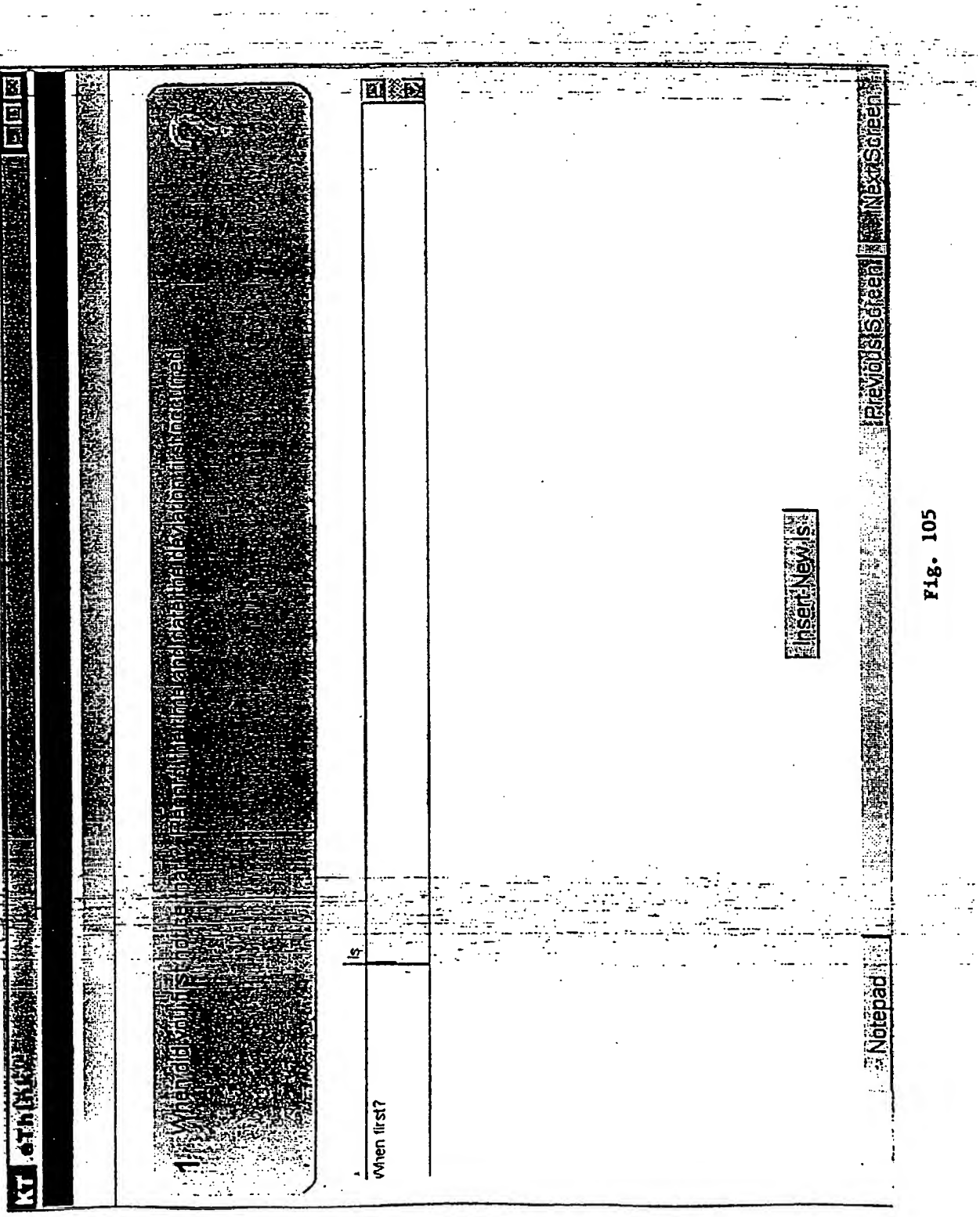

When first?
Is
Insert New Is
Previous Screen
Next Screen
Notepad

Fig. 105

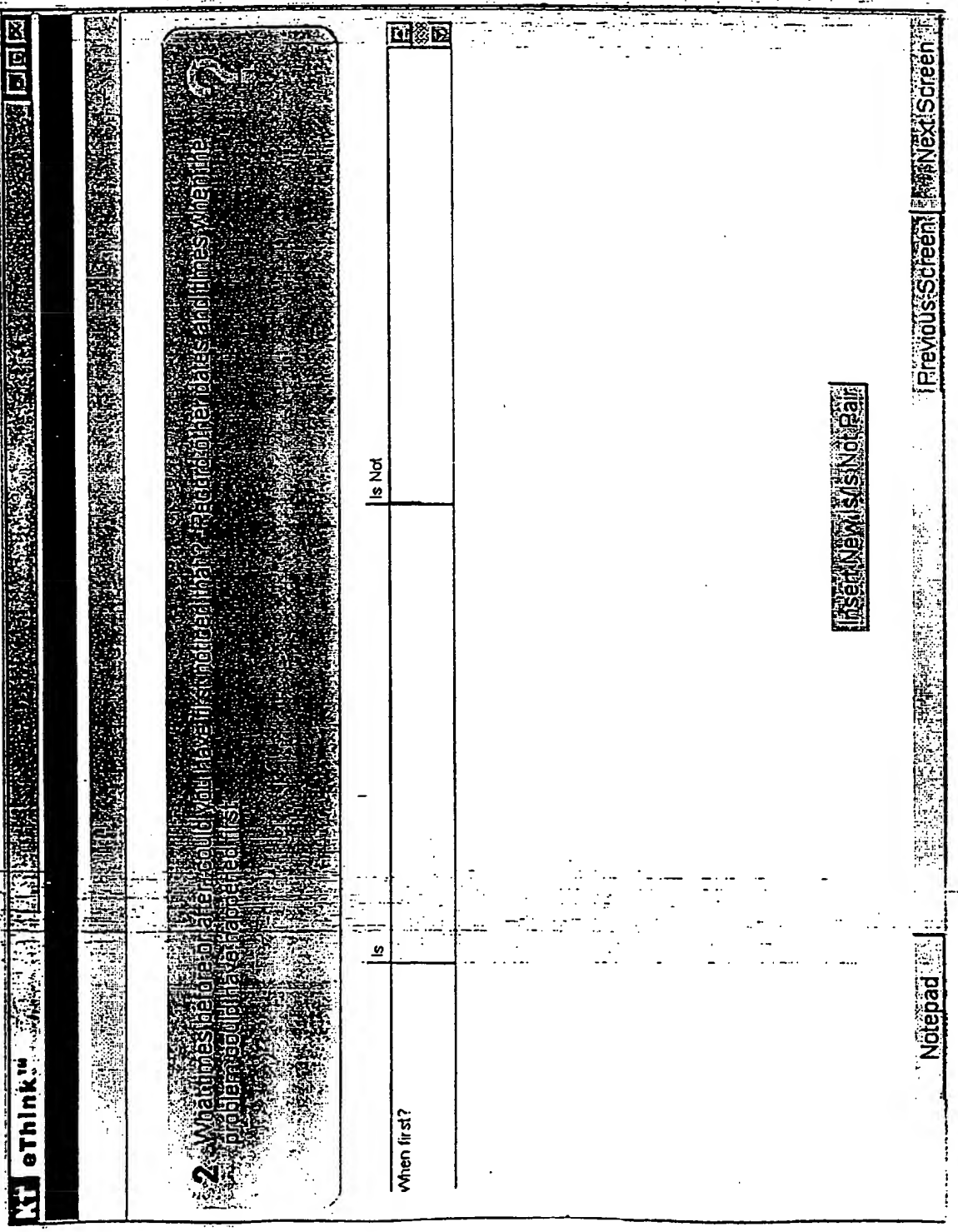

eThink™
When first?
Is
Is Not
Insert New Is/Is Not Pair
Previous Screen
Next Screen
Notepad

Fig. 106

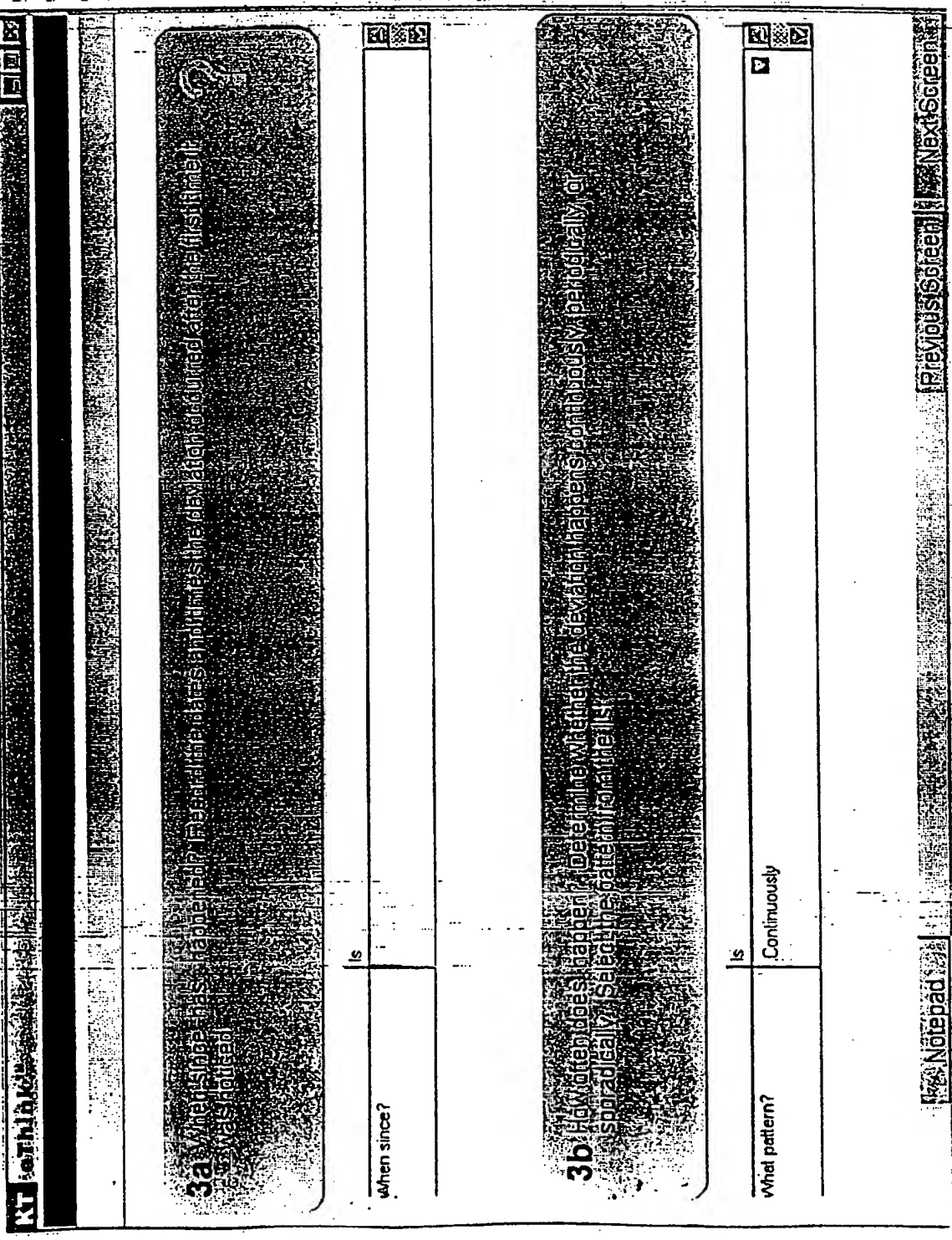

When since?
Is
What pattern?
Is
Continuously
Notepad
Previous Screen
Next Screen

Fig. 107

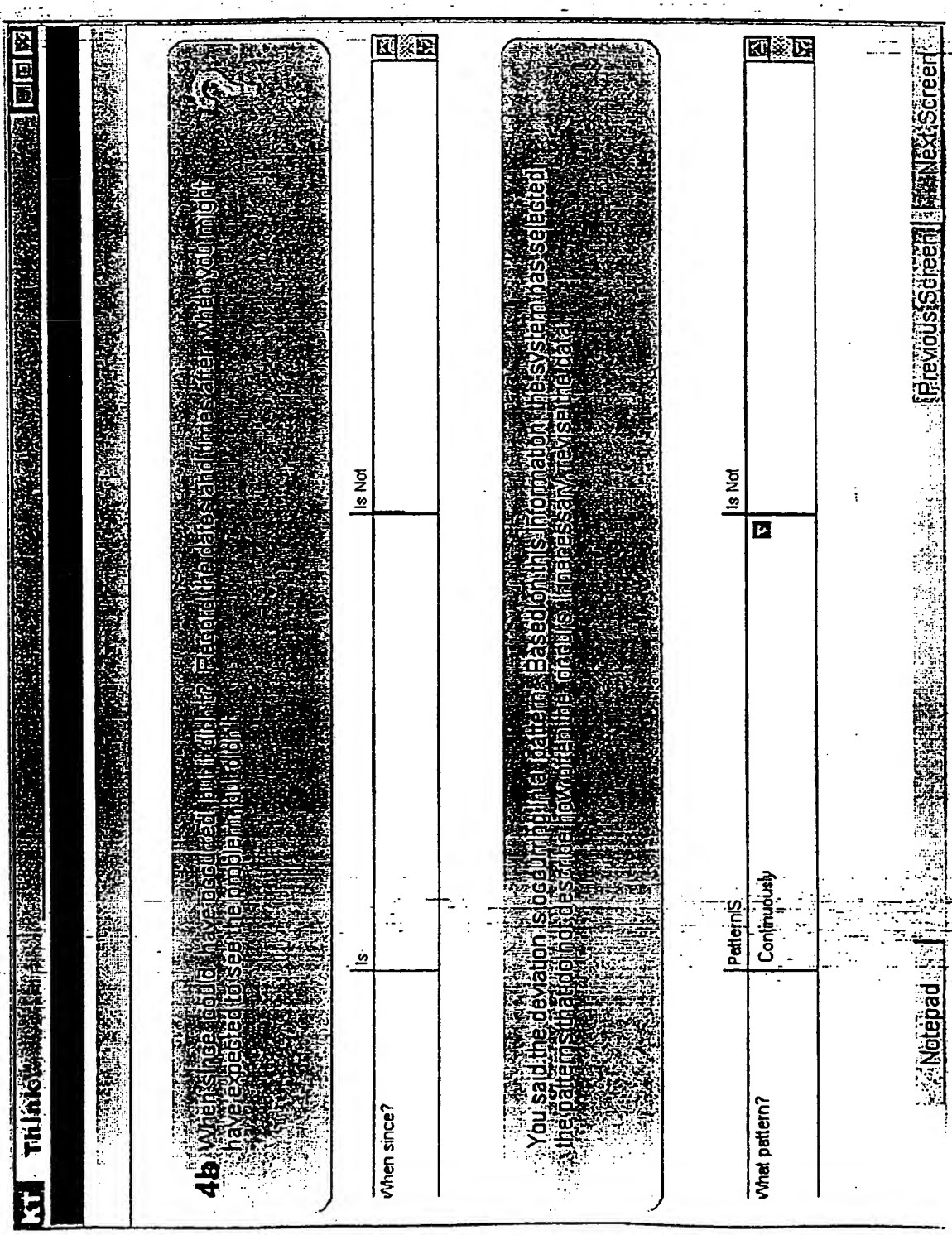

Thinker
4b
When since?
Is
Is Not
You said the deviation
Pattern is
What pattern?
Continuously
Is Not
Notepad
Previous Screen
Next Screen

Fig. 108

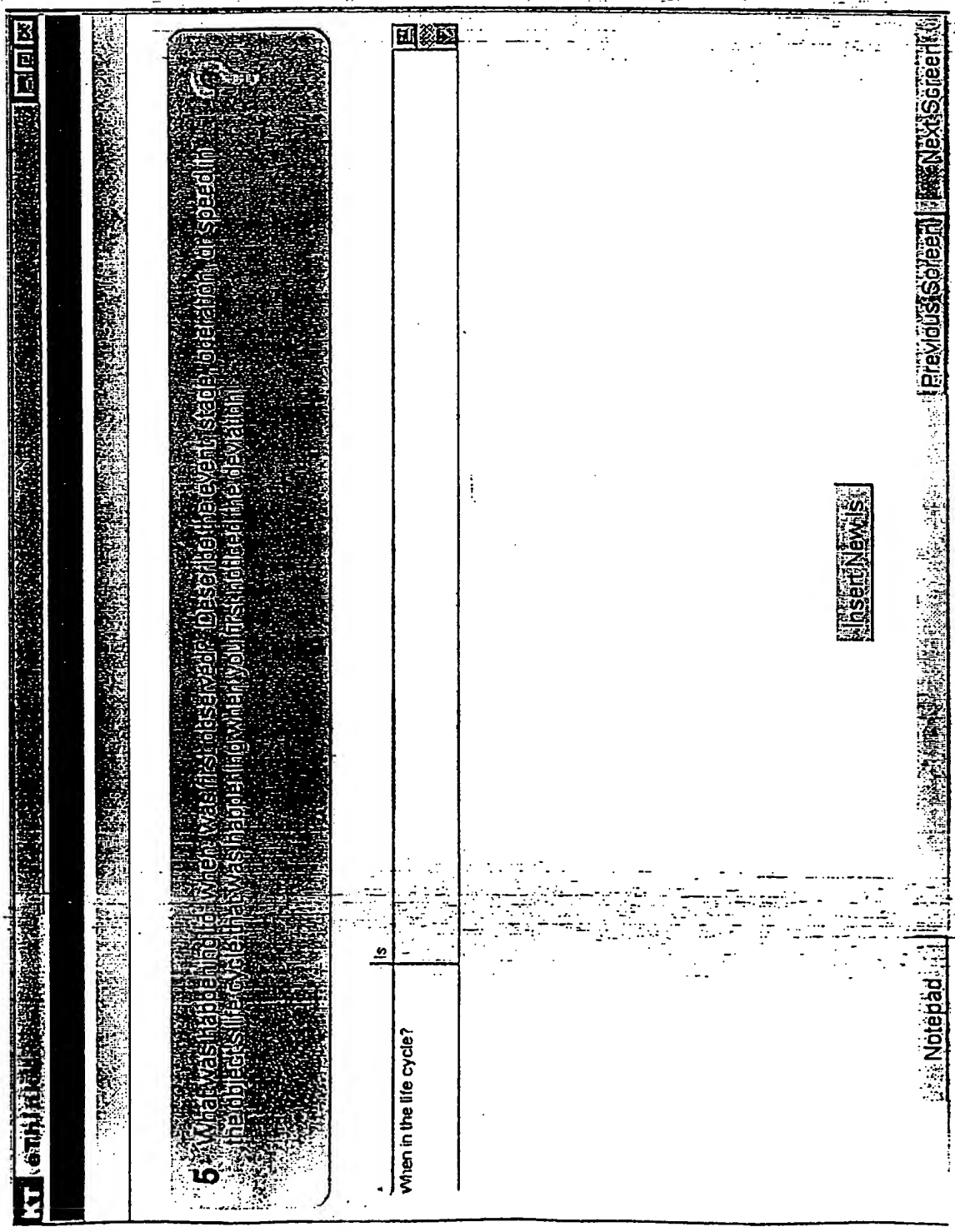

KT
5.
When in the life cycle?
Is
Insert News
Notepad
Previous Screen
Next Screen

Fig. 109

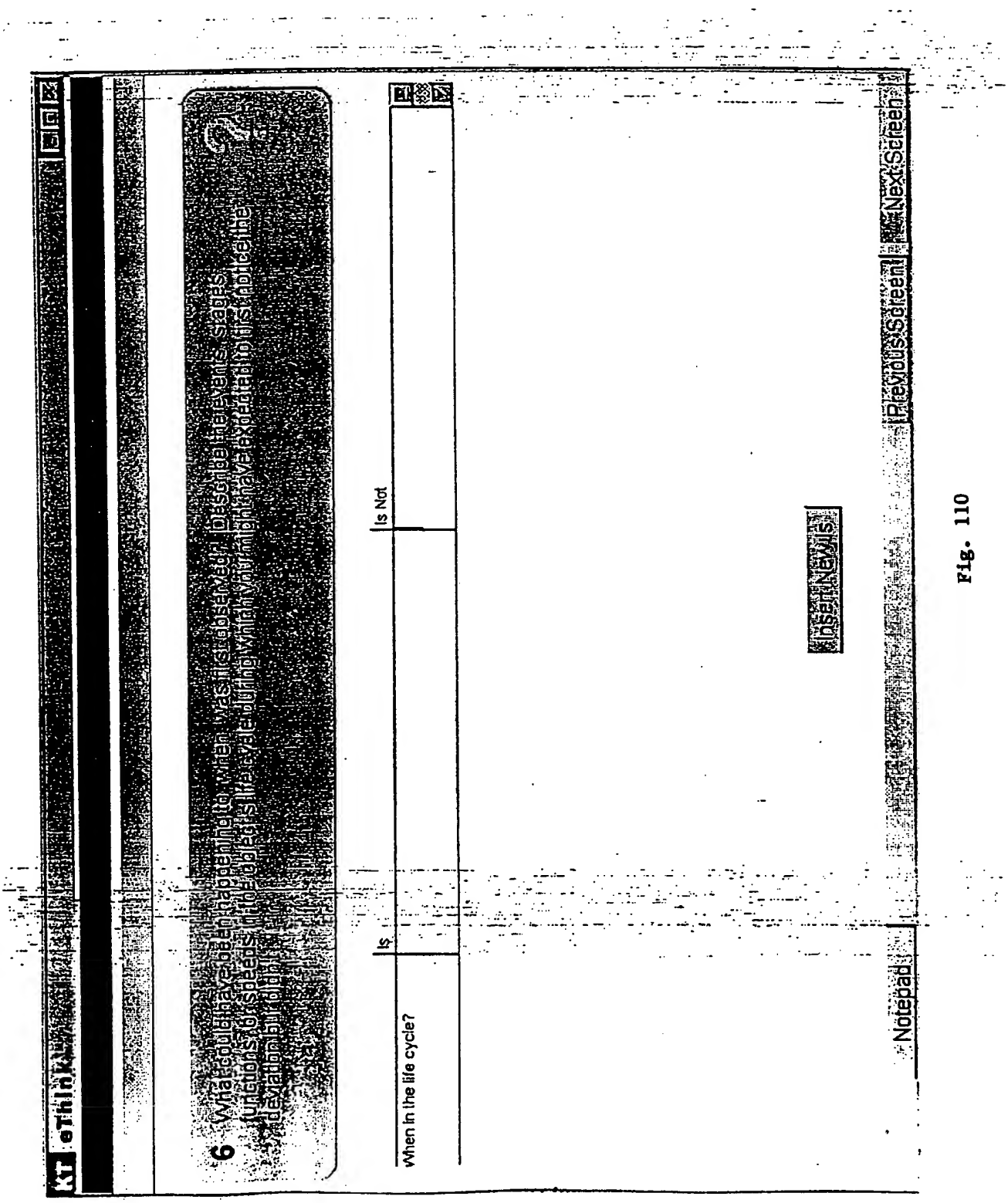

KT eThink
6
When in the life cycle?
Is
Is Not
Insert New Item
Notepad
Previous Screen
Next Screen

Fig. 110

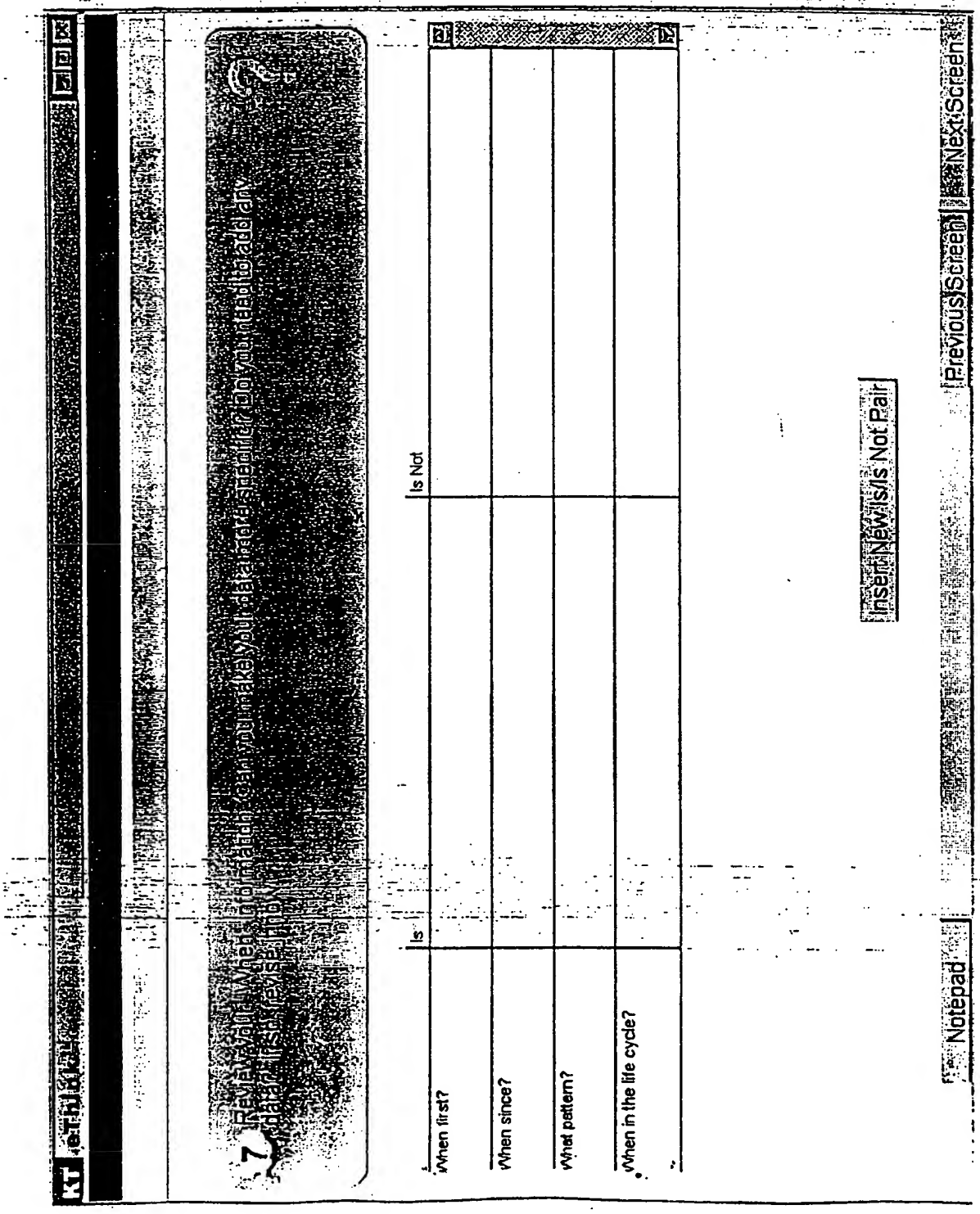

Is
Is Not
When first?
When since?
What pattern?
When in the life cycle?
Insert New Is/Is Not Pair
Notepad
Previous Screen
Next Screen

Fig. 111

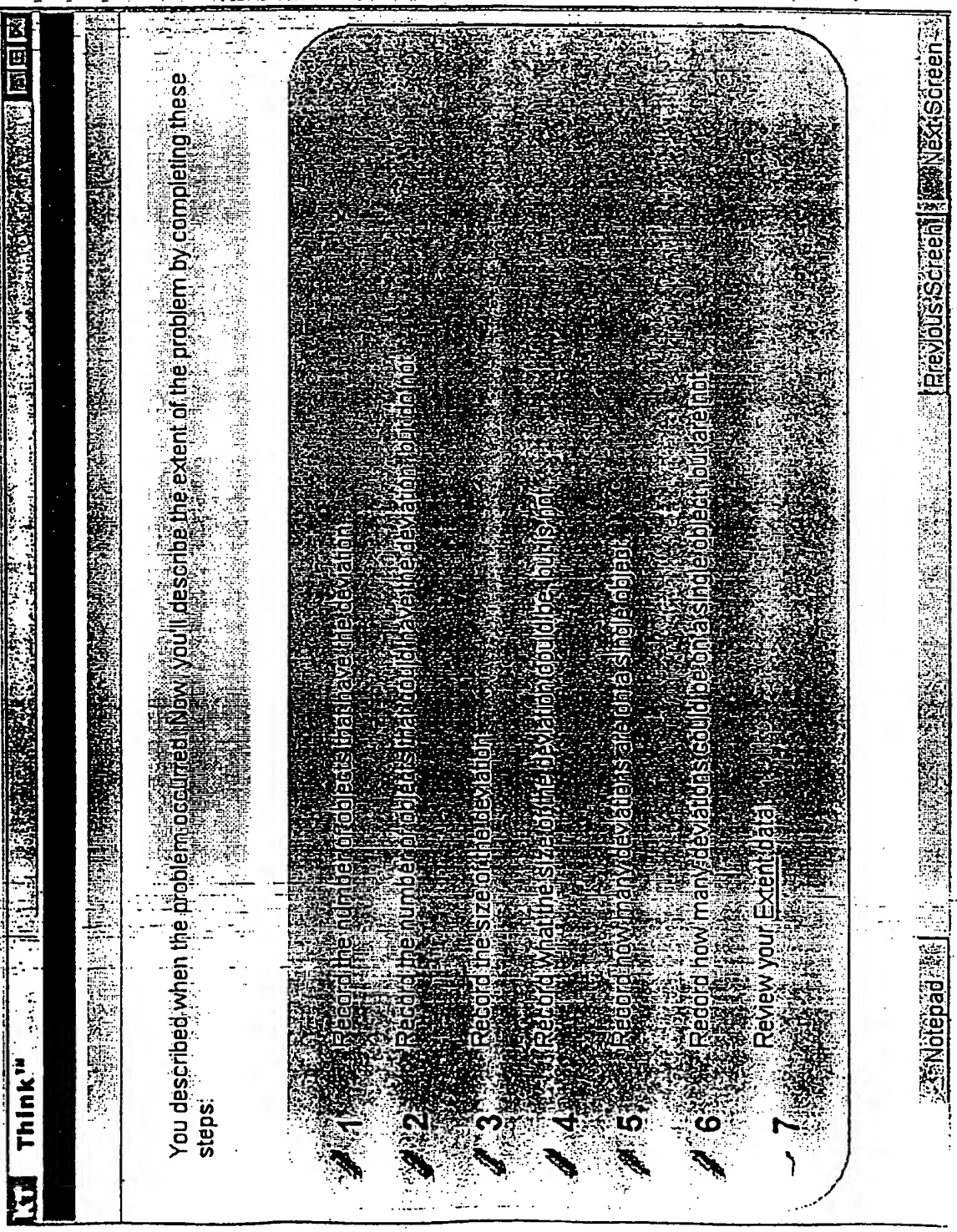

Think"
You described when the problem occurred. Now you'll describe the extent of the problem by completing these steps:
1 Record the number of objects that have the deviation
2 Record the number of objects that could have the deviation but do not
3 Record the size of the deviation
4 Record what the size of the deviation could be, but is not
5 Record how many deviations are data as a single object
6 Record how many deviations could be data as single objects but are not
7 Review your Extent data
Notepad
Previous Screen
Next Screen

Fig. 112

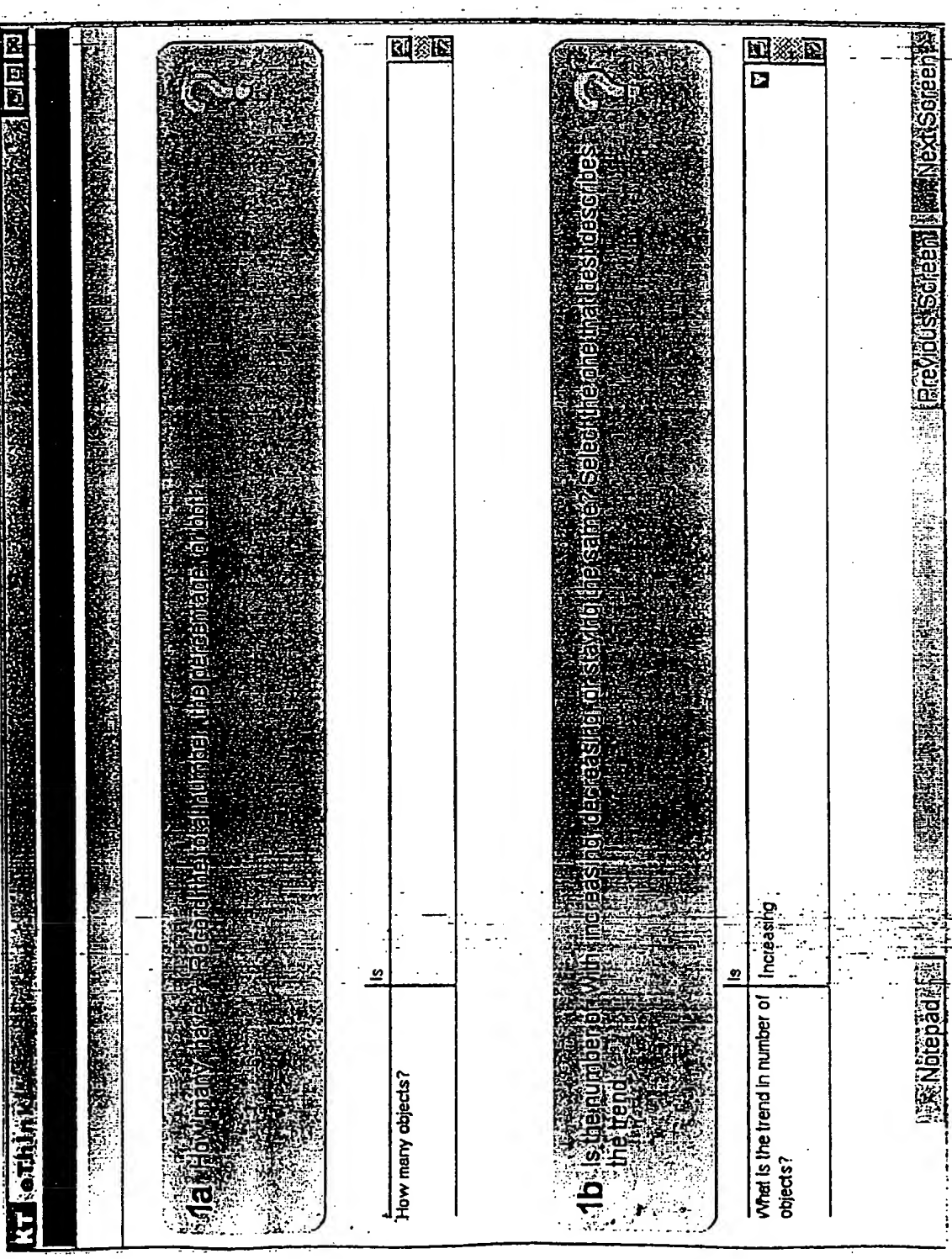

KT eThink
1a How many have Regan the total number, the percentage, or both?
How many objects?
Is
1b Is the number with increasing, decreasing, or staying the same? Select the one that best describes the trend
What is the trend in number of objects?
Is
Increasing
Notepad
Previous Screen
Next Screen

Fig. 113

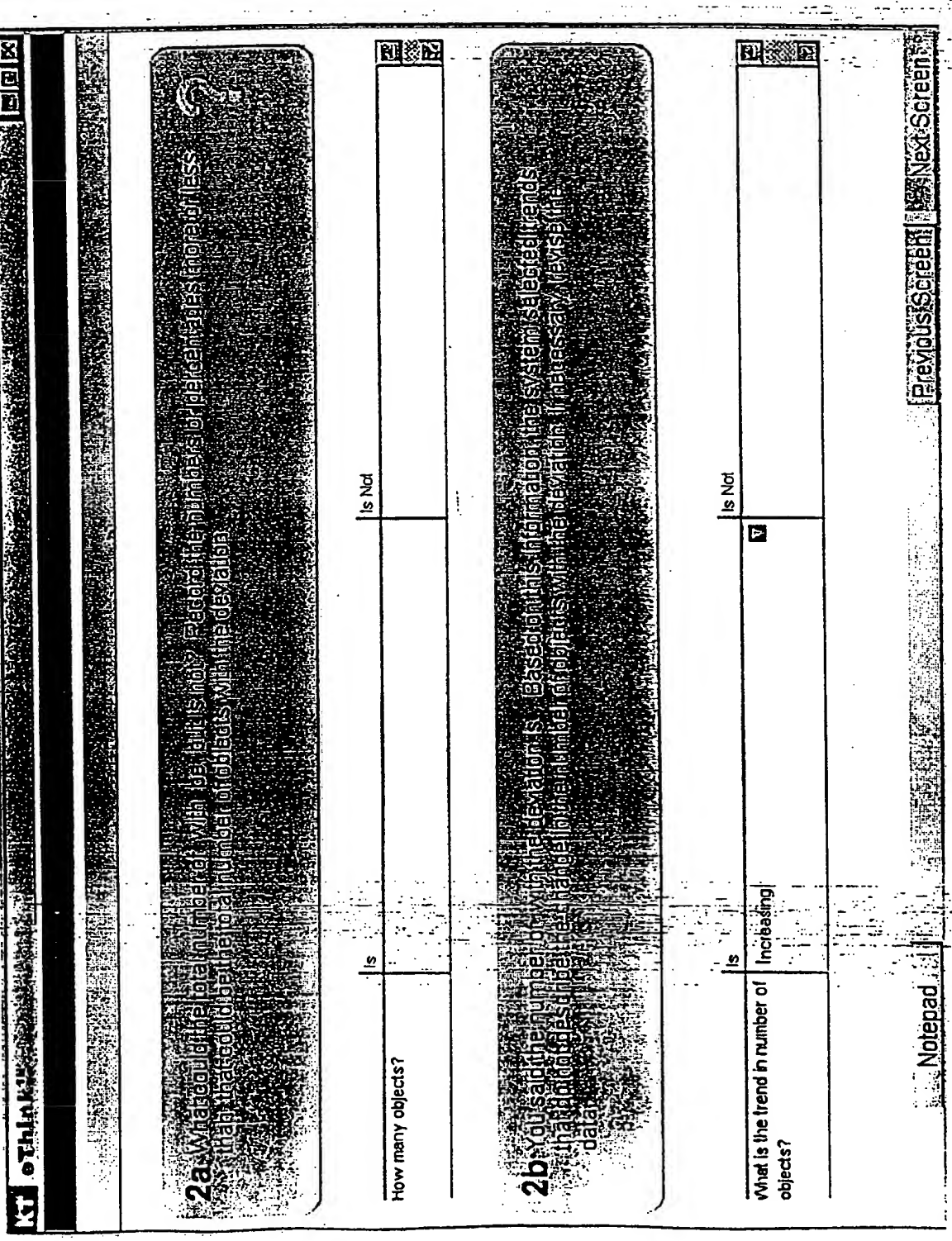

KT eThink
2a
How many objects?
Is
Is Not
2b
What is the trend in number of objects?
Is
Increasing
Is Not
Notepad
PreviousScreen
Next Screen

Fig. 114

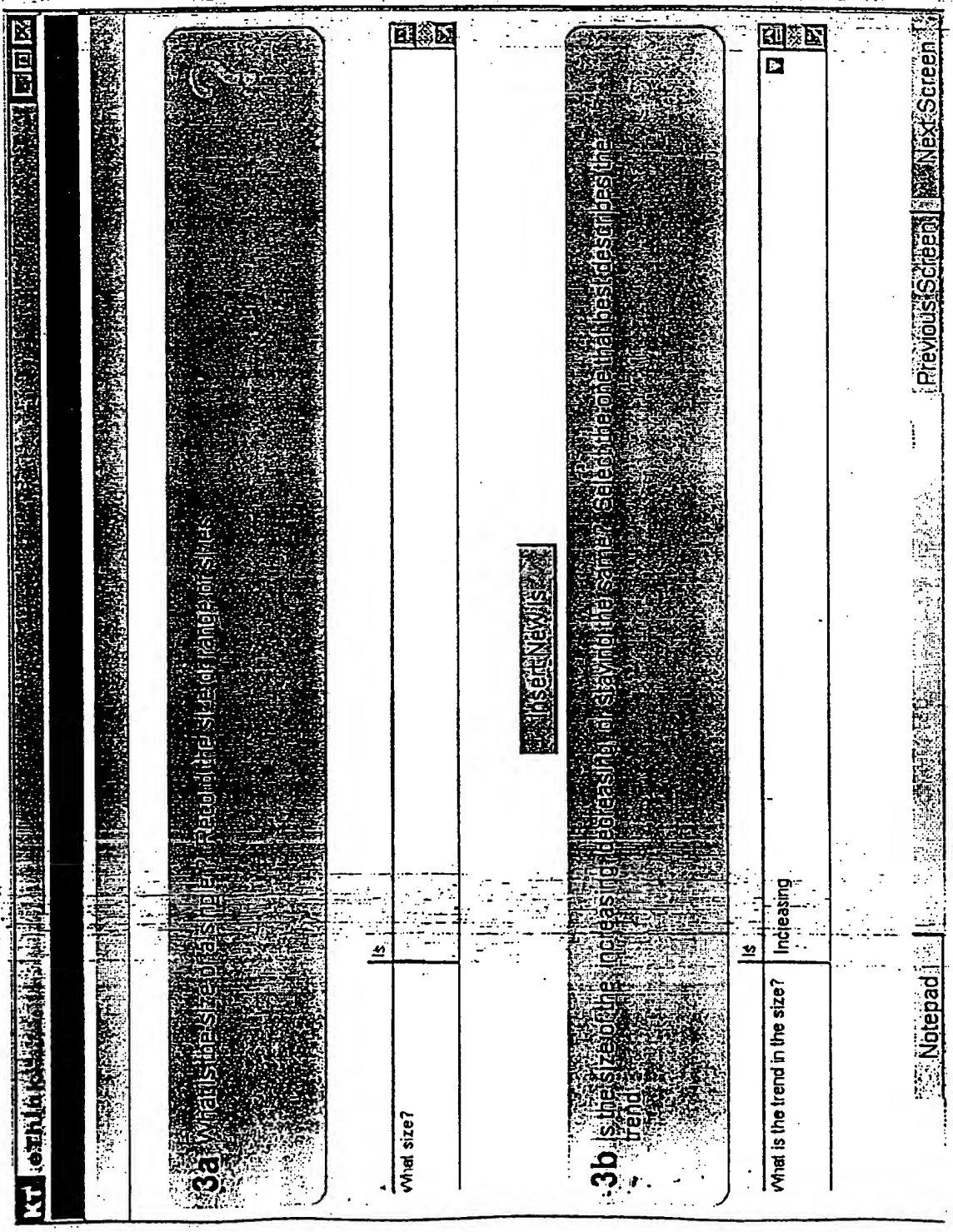

3a
What size?
Is
What size?
Insert New Is
3b
Is the size of the
trend?
Is
What is the trend in the size?
Increasing
Notepad
Previous Screen
Next Screen

Fig. 115

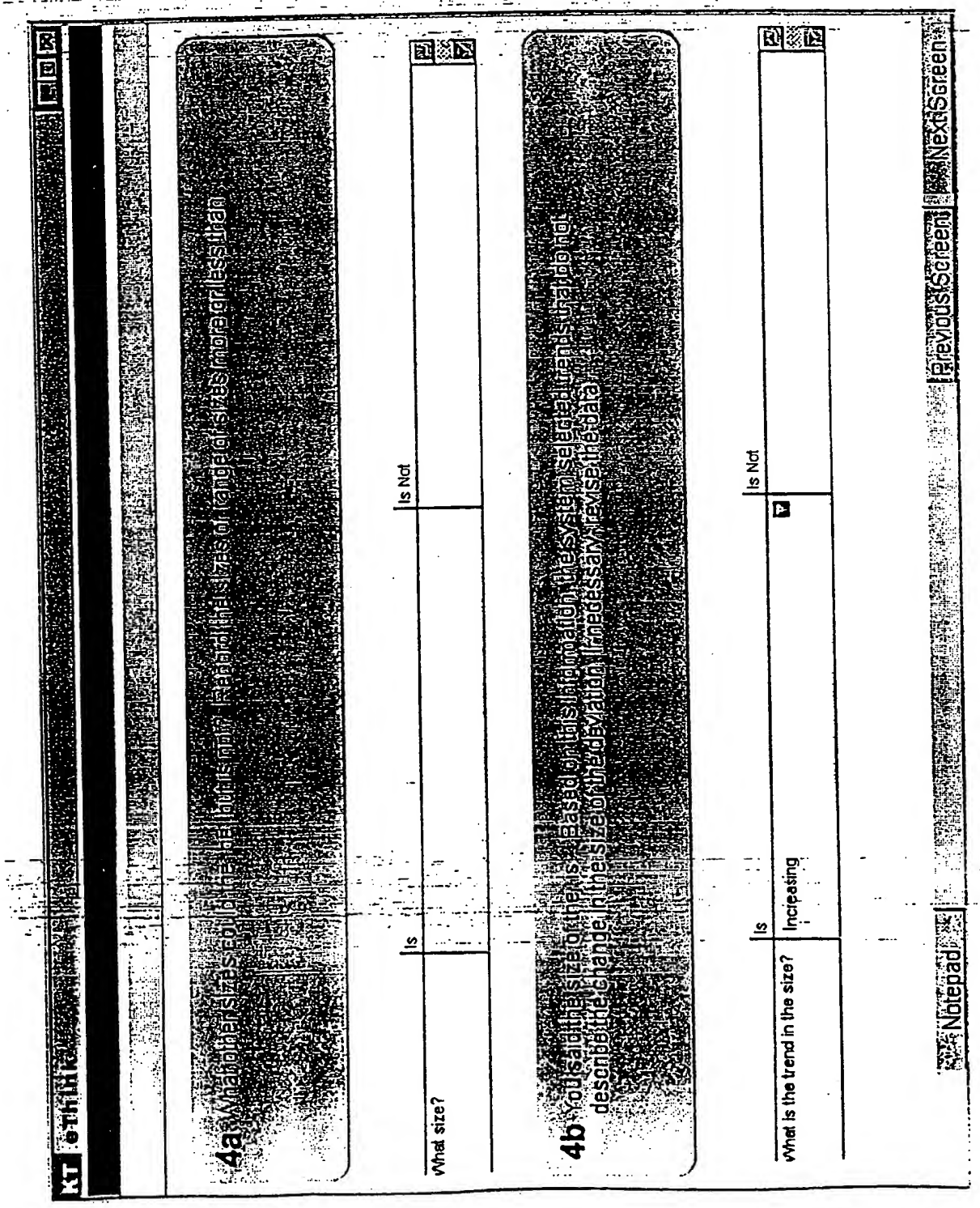

KT
4a
What other sizes could the fabric mill fabricate if sizes more or less than
What size?
Is
Is Not
4b
You said the size of the is Based on this information, the system selected the rule that
describe the change in the size of the over time. If necessary, revise the data
What is the trend in the size?
Is
Increasing
Is Not
Notepad
Previous Screen
Next Screen

Fig. 116

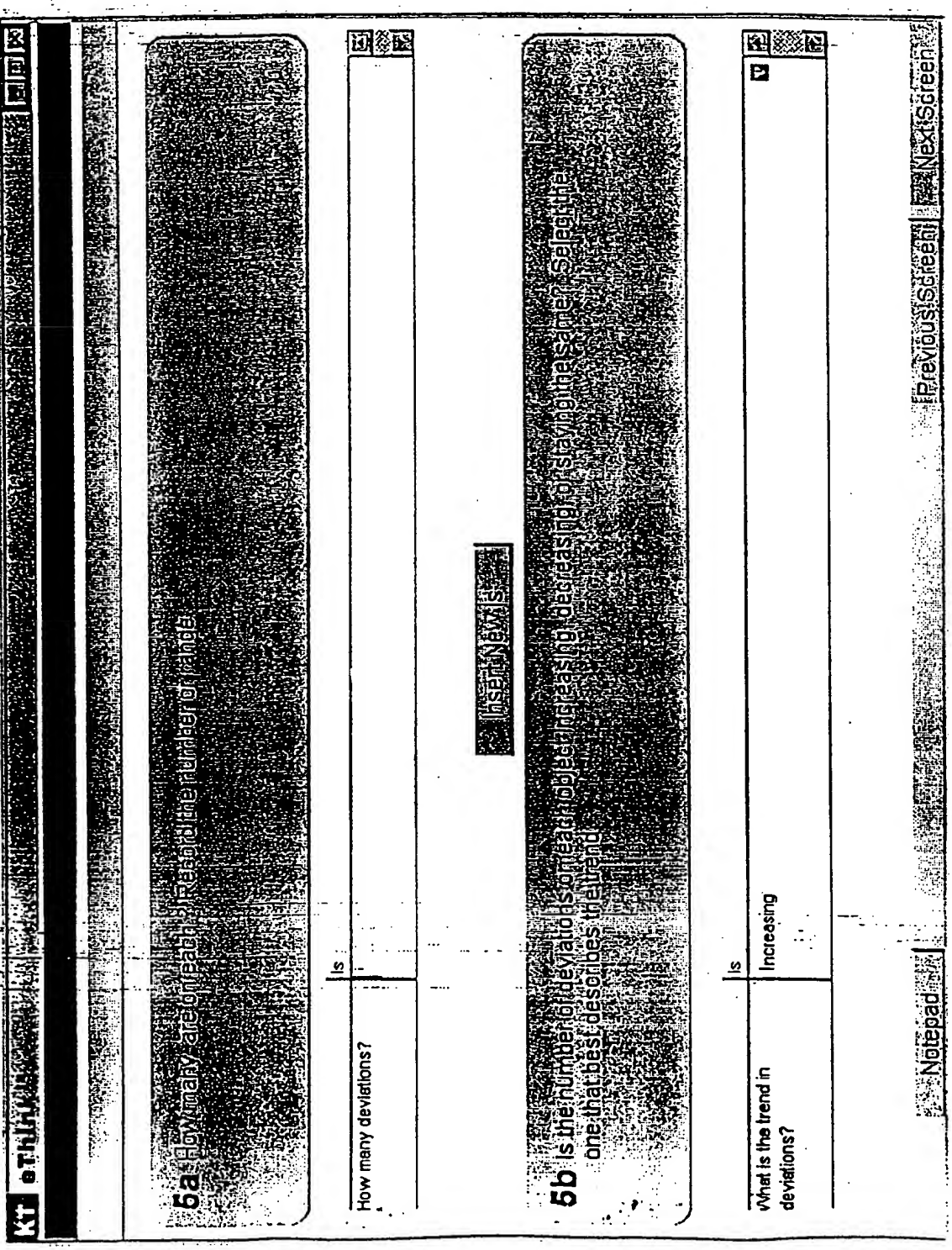

KT eThink
6a How many are on each of the number of rods
How many deviations?
Is
User Needs
5b Is the number of deviations on each objective increasing, decreasing or staying the same? Select the one that best describes the trend
What is the trend in deviations?
Is
Increasing
Notepad
Previous Screen
Next Screen

Fig. 117

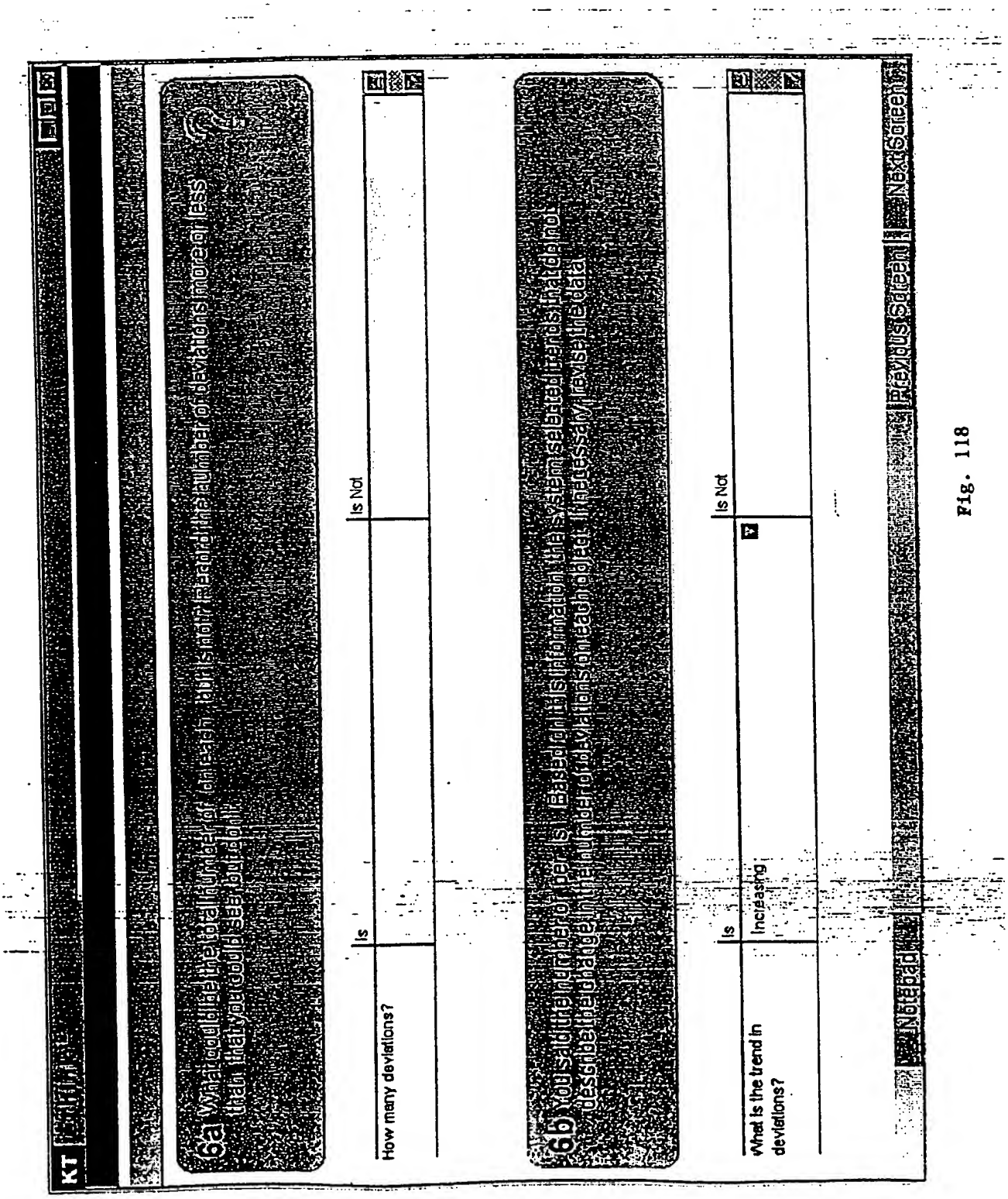

KT
6a
How many deviations?
Is
Is Not
6b
What is the trend in deviations?
Is
Increasing
Is Not
Notepad
Previous Screen
Next Screen

Fig. 118

KT
Review your Extended Trend Data. Can you find the following data in your data? Does any data need to be added? If
Set Review Criteria
Is
Is Not
When in the life cycle?
How many objects?
What is the trend in number of objects?
What size?
What is the trend in the size?
How many deviations?
Insert New Analysis Note
Notepad
Previous Screen
Next Screen

Fig. 119

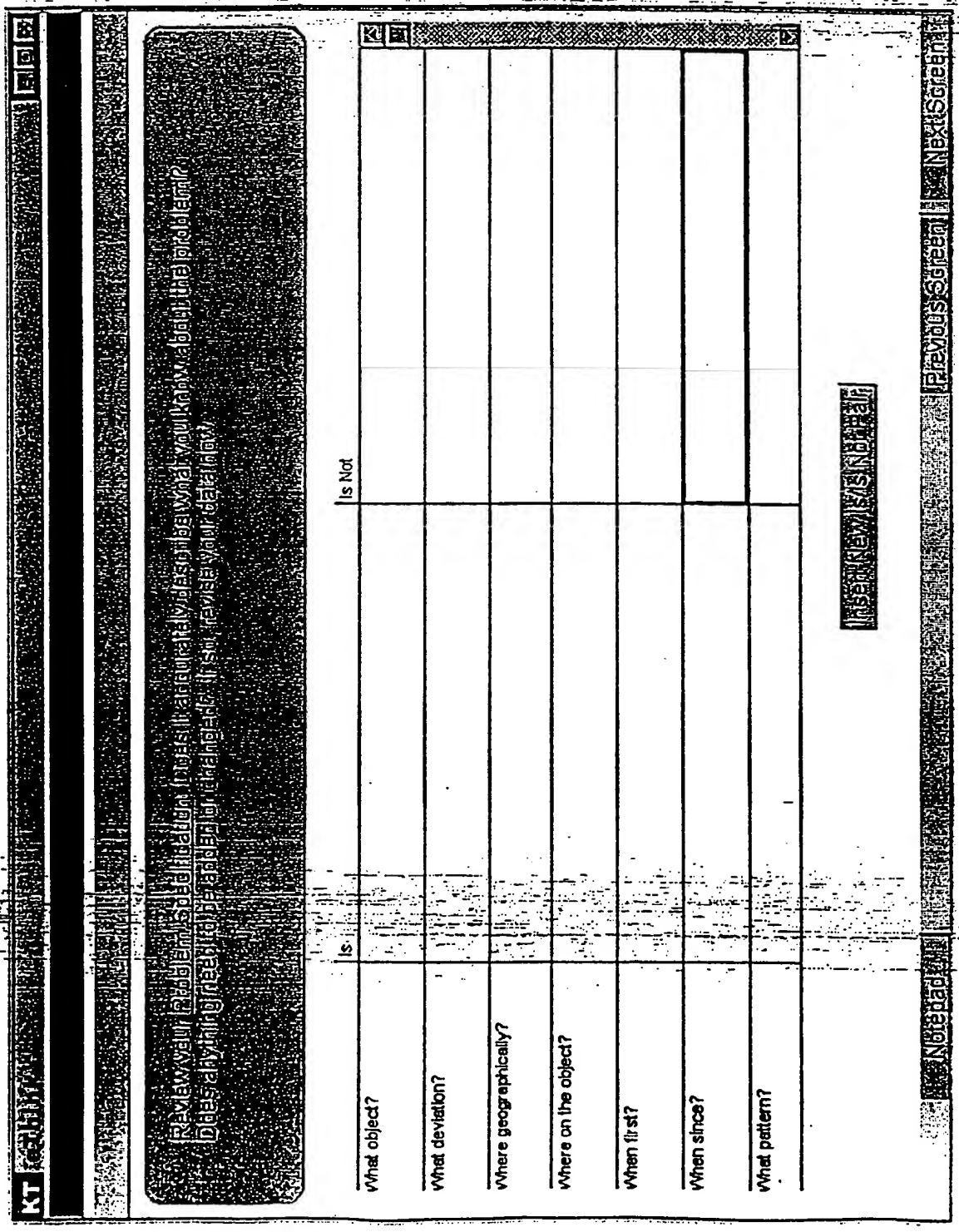

KT
Review your problem/solution (next step: what you know about the problem)
Objectively describe what you know about the problem
Is
Is Not
What object?
What deviation?
What geographically?
Where on the object?
When first?
When since?
What pattern?
Insert New IS/IS NOT Pair
Notepad
Previous Screen
Next Screen

Fig. 120

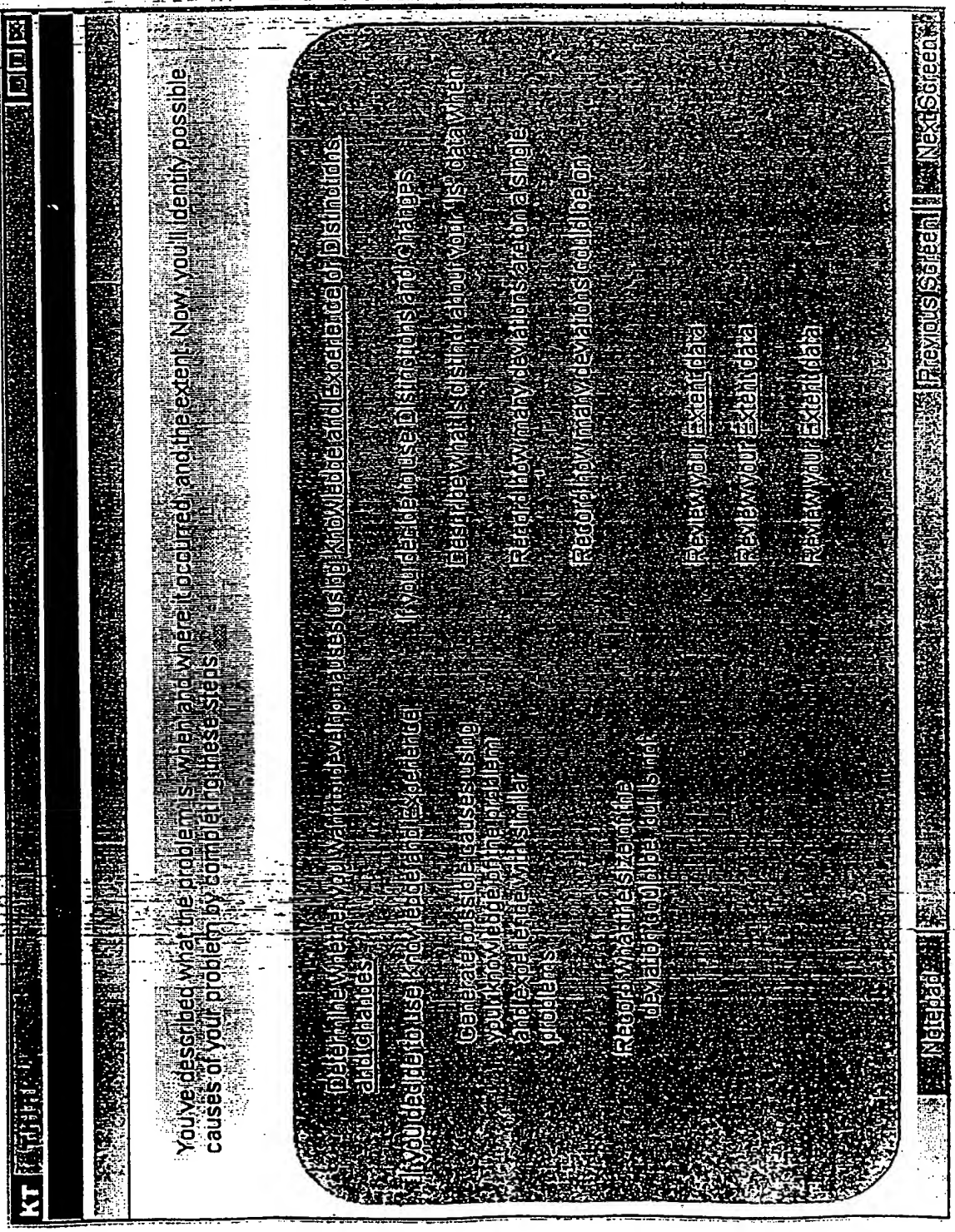

KT
You've described what the problem is. When and where it occurred, and the extent. Now, you'll identify possible causes of your problem by completing these steps.
Determine the When and Where you'll develop causes using knowledge and experience of distinctions and changes
If you decide to use distinctions and changes
Describe what's distinctive about your IS data when
Record how many deviations can be found in a single
Review your Extent data
Review your Extent data
Review your Extent data
Notepad
Previous Screen
Next Screen

Fig. 121

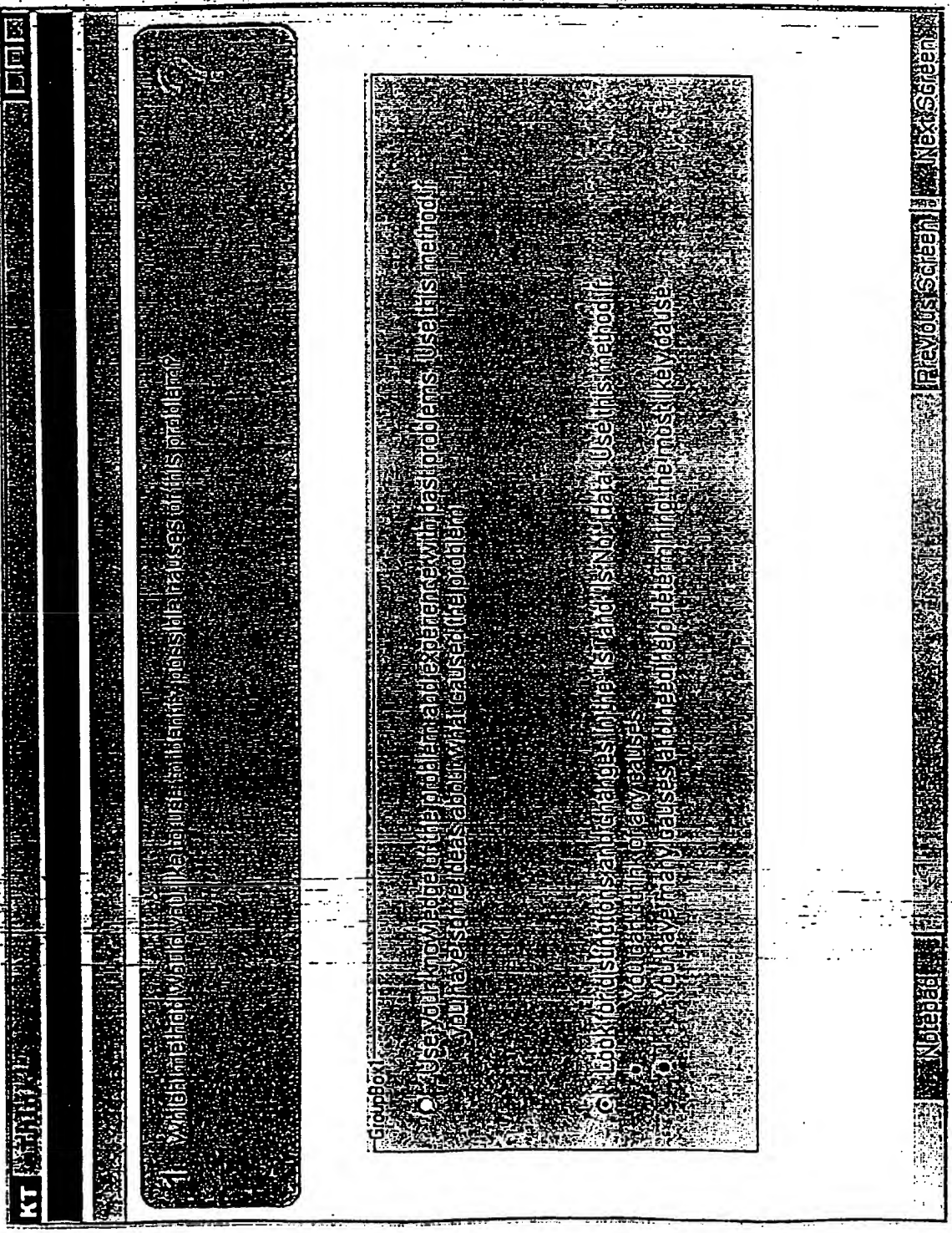

KT
Which method would you use to identify possible causes of this problem?
Use your knowledge of the problem and experience with past problems. Use this method.
Look for distinctions and changes in the "Stand" "Not" data. Use this method.
You have some ideas about what caused the problem.
You have many causes and need to determine the most likely cause.
Notepad
Previous Screen
Next Screen

Fig. 122

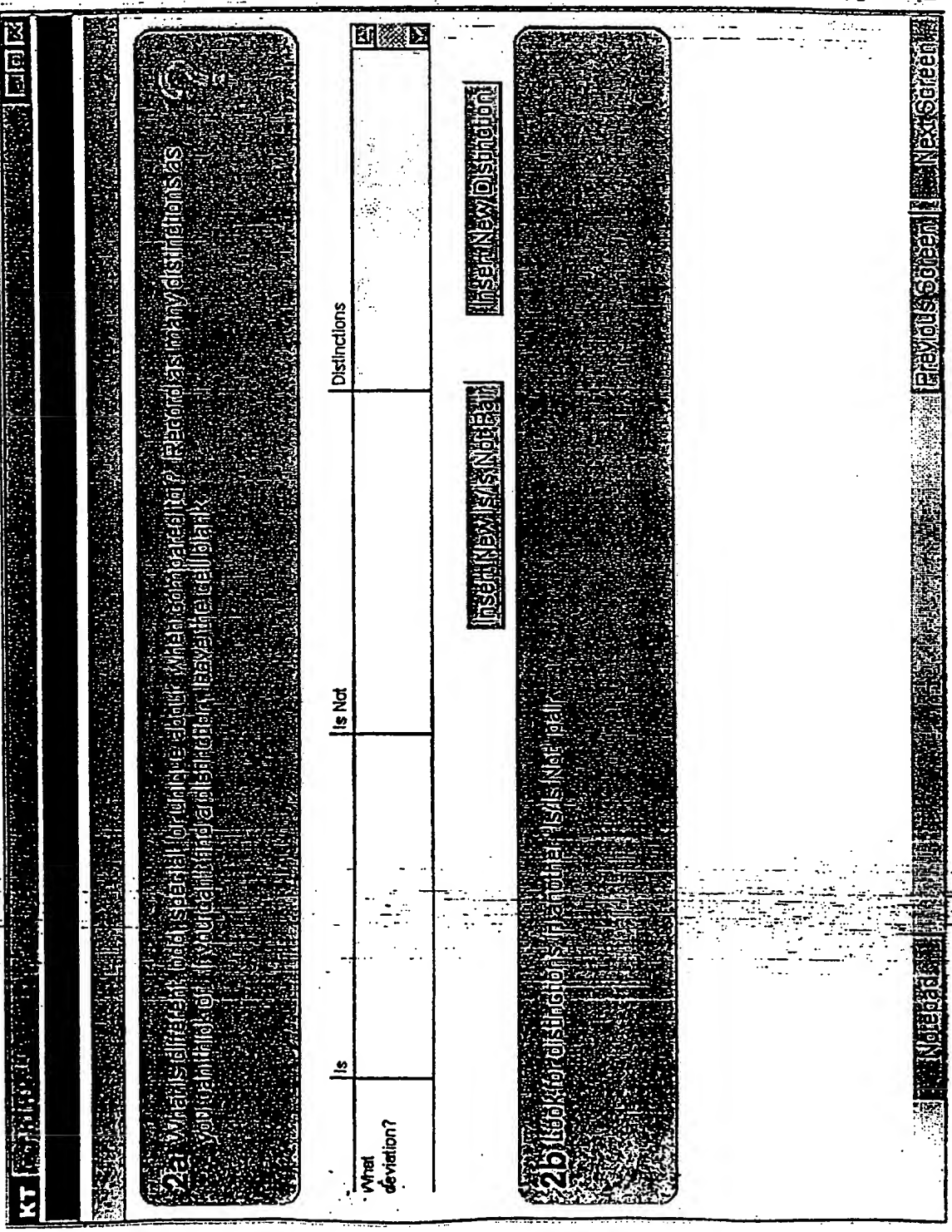

KT
2a) What's different between these two records?
2b) Look for distinctions in Normal Is/Is Not pair
What deviation?
Is
Is Not
Distinctions
Insert Next Distinction
Insert Next Is/Is Not Pair
Notepad
Previous Screen
Next Screen

Fig. 123

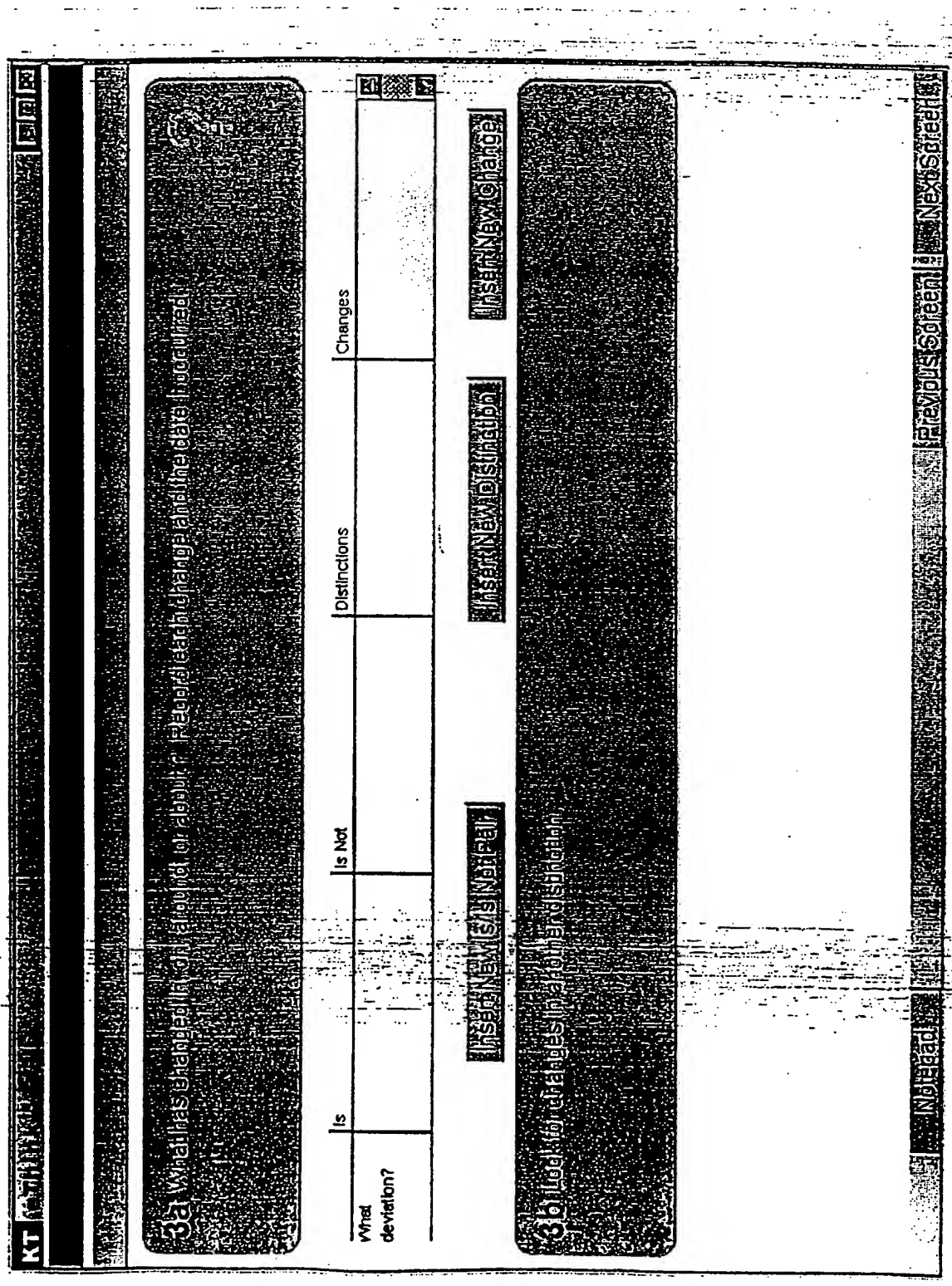

KT
3a
What has changed? Record each change and the data involved
What deviation?
Is
Is Not
Distinctions
Changes
Insert New Distinction
Insert New Change
3b
Look for changes in other dimensions
Notepad
Previous Screen
Next Screen

Fig. 124

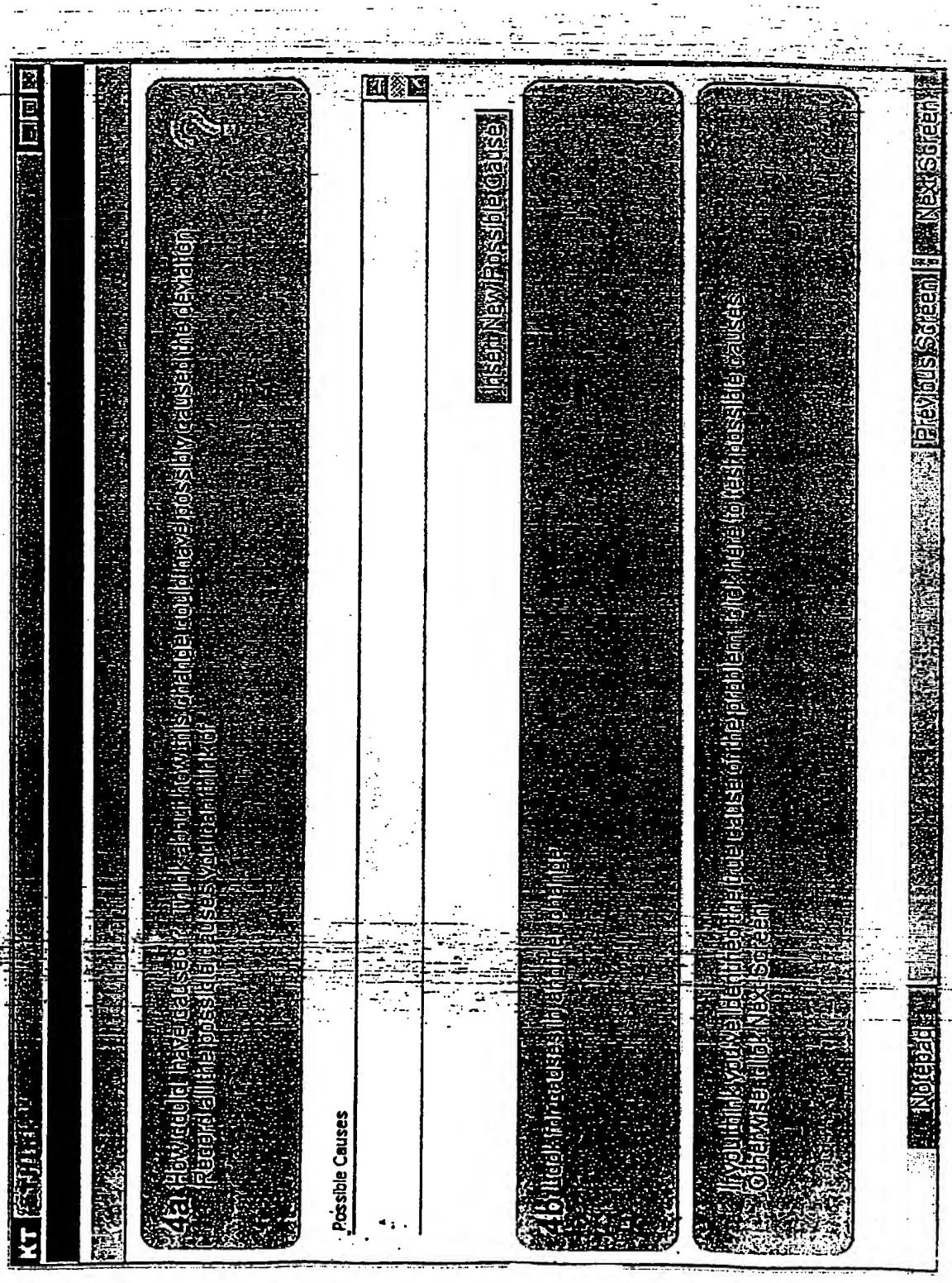

KT
Possible Causes
Insert New Possible Cause
Previous Screen
Next Screen

Fig. 125

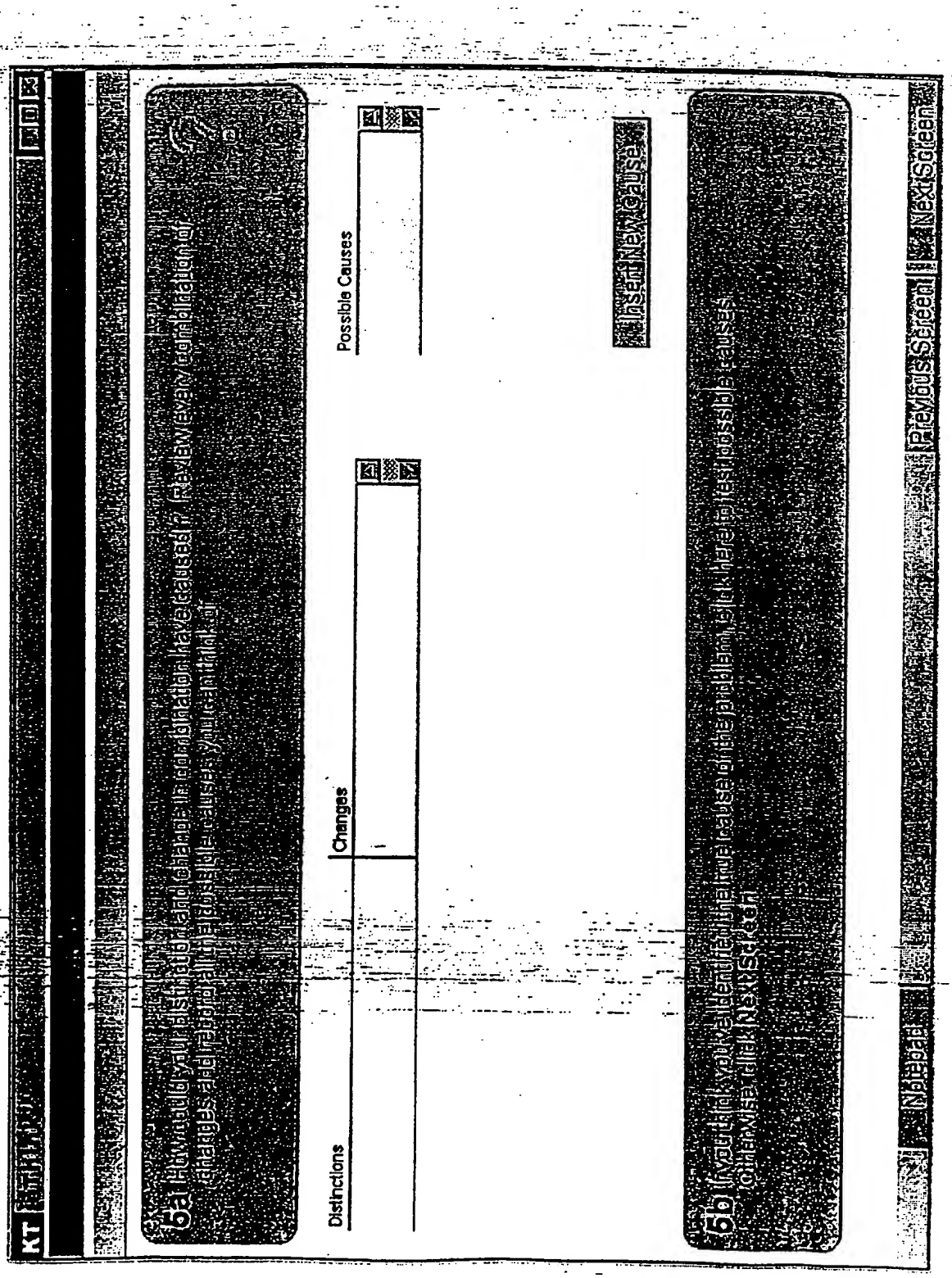

KT
Distinctions
Changes
Possible Causes
Insert Next Cause
Previous Screen
Next Screen

Fig. 126

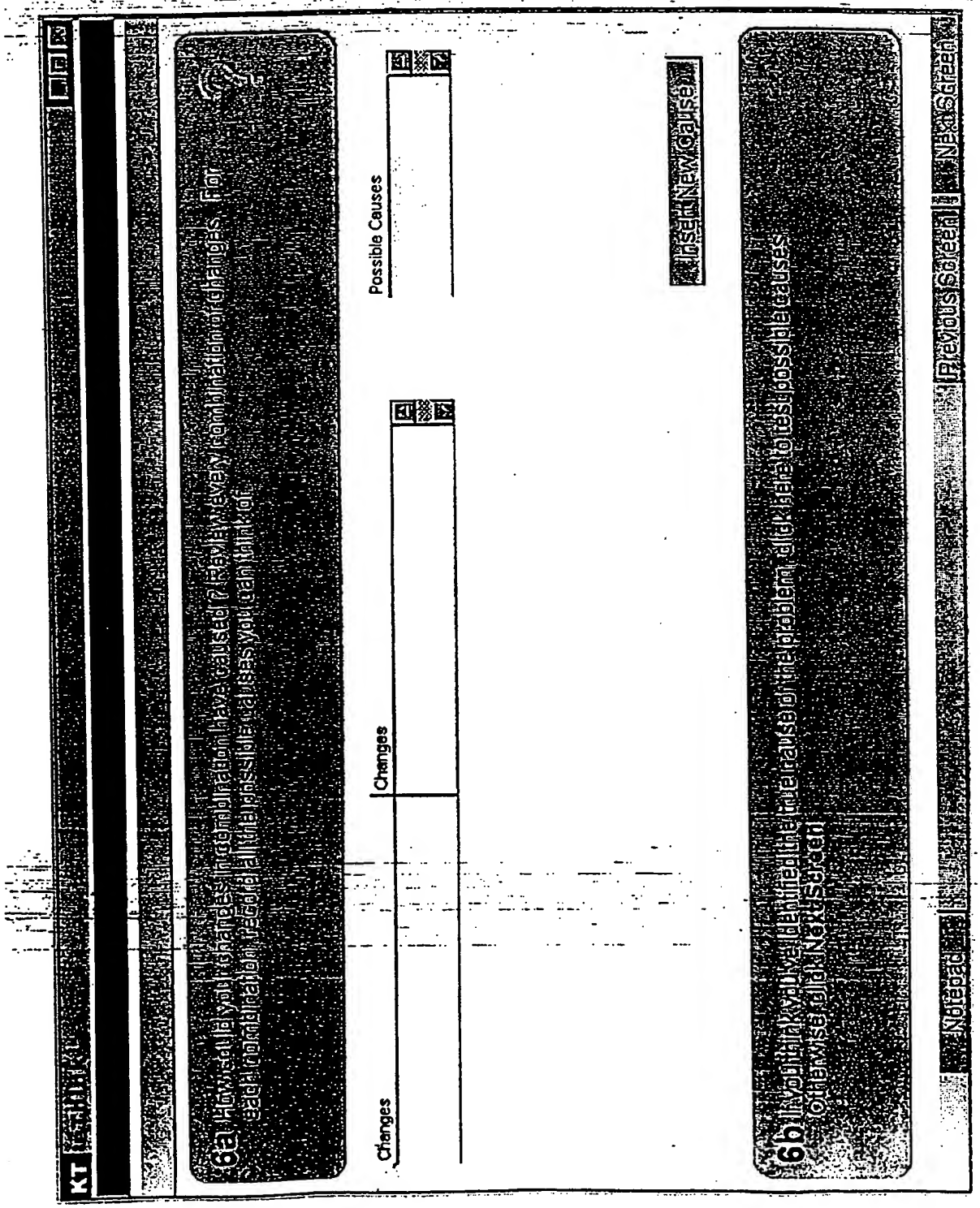

KT
Changes
Possible Causes
Insert New Cause
Notepad
Previous Screen
Next Screen

Fig. 127

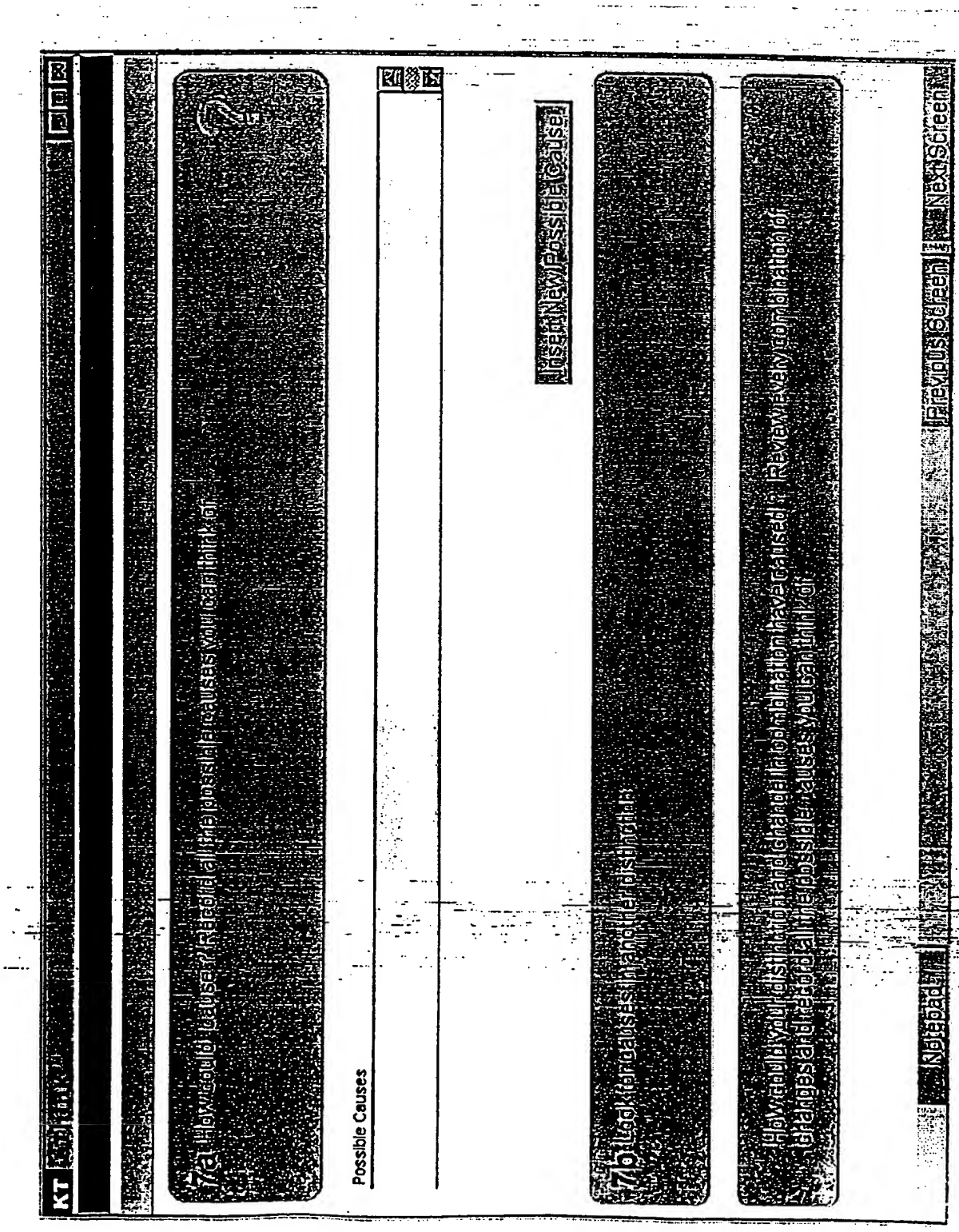


Fig. 128

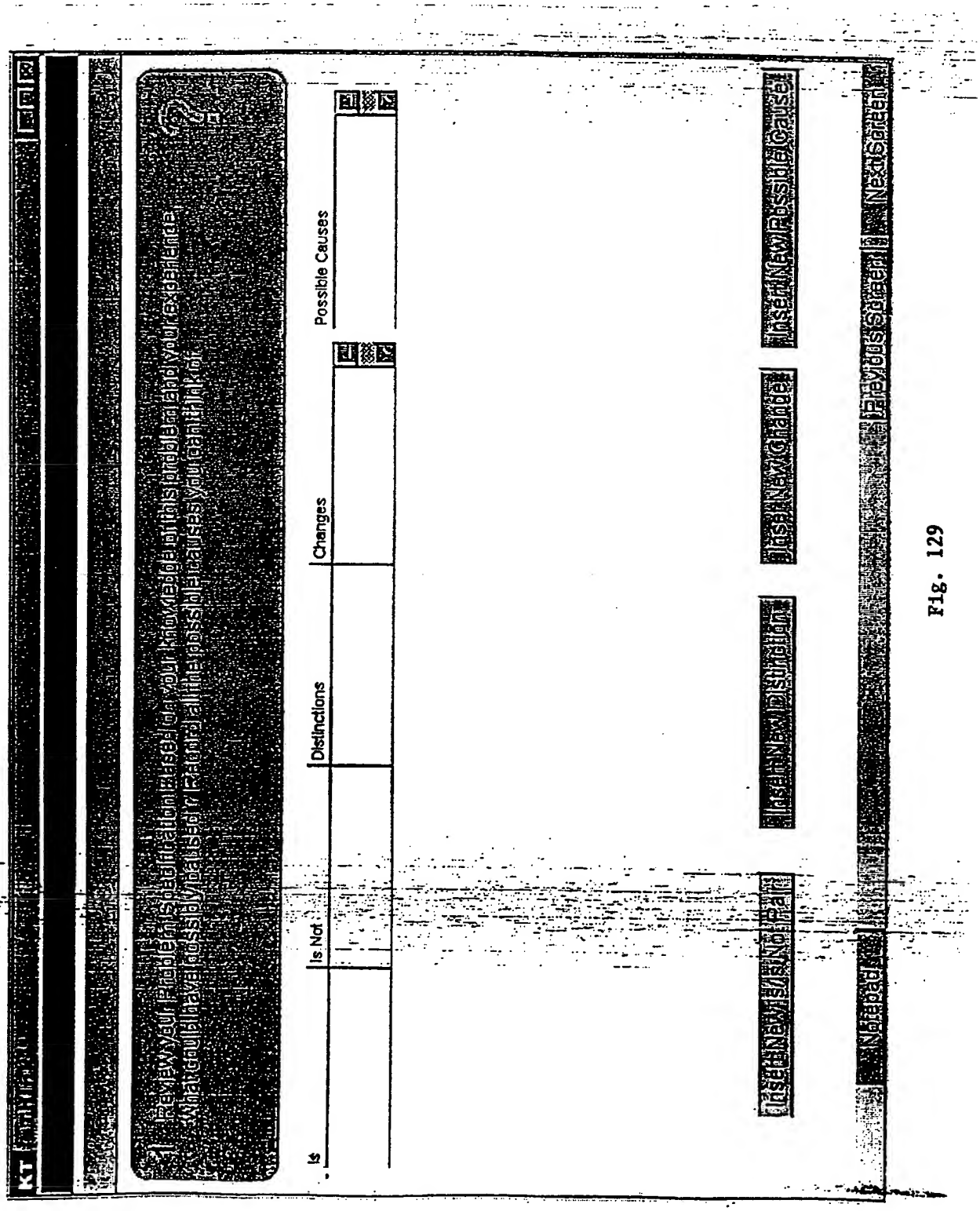
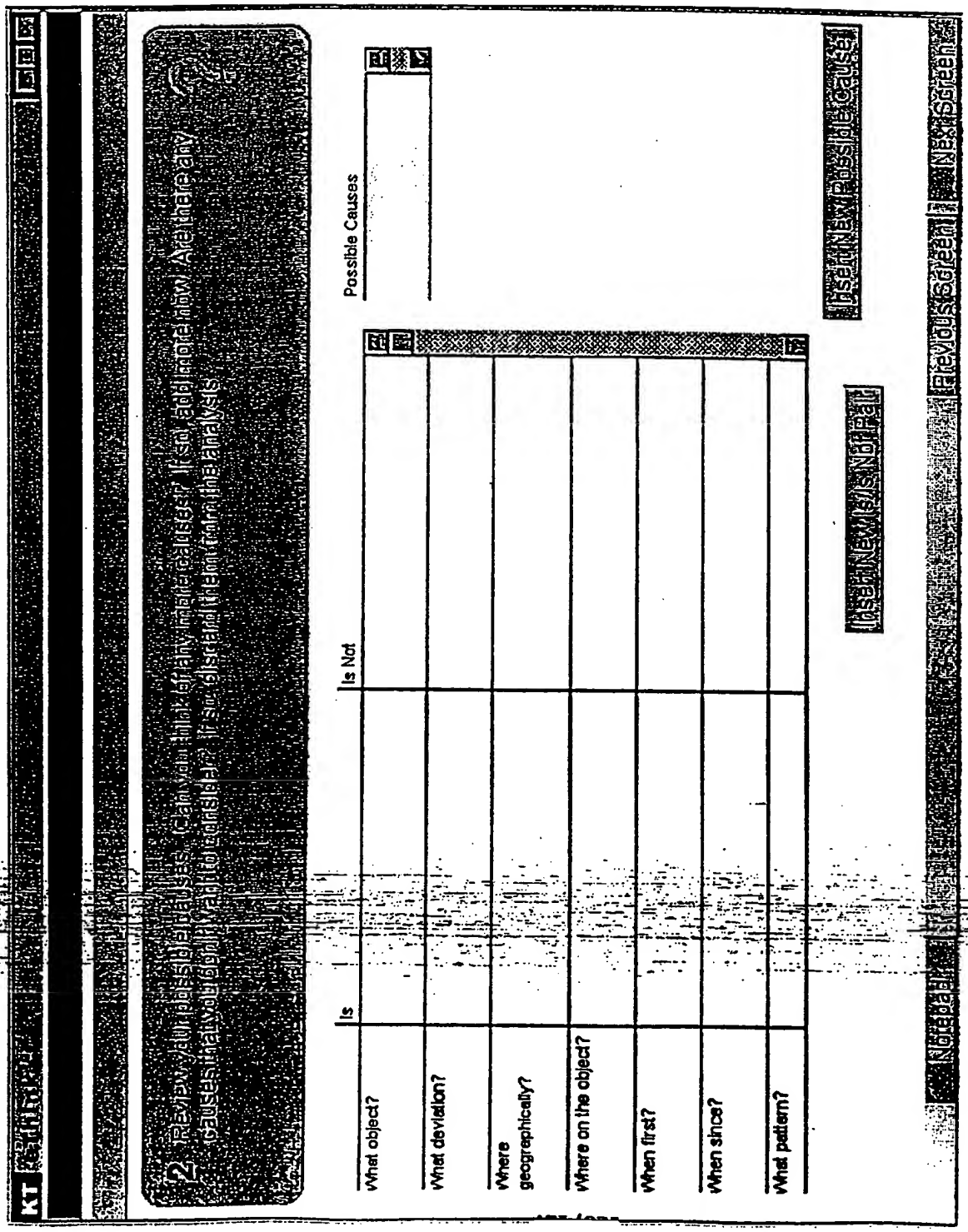

KT
Review your Problem Solving Situation
Is
Is Not
Distinctions
Changes
Possible Causes
Insert New Distinction
Insert New Change
Insert New Possible Cause
Insert New Is/Is Not Pair
Notepad
Next Screen

Fig. 129


KT
2 Review your possible causes. Can you think of any more causes? If so, add them now. Are they any causes that you can't rule out? If so, circle them. Are they any causes that you can't rule out? If so, circle them. Are they any causes that you can't rule out? If so, circle them

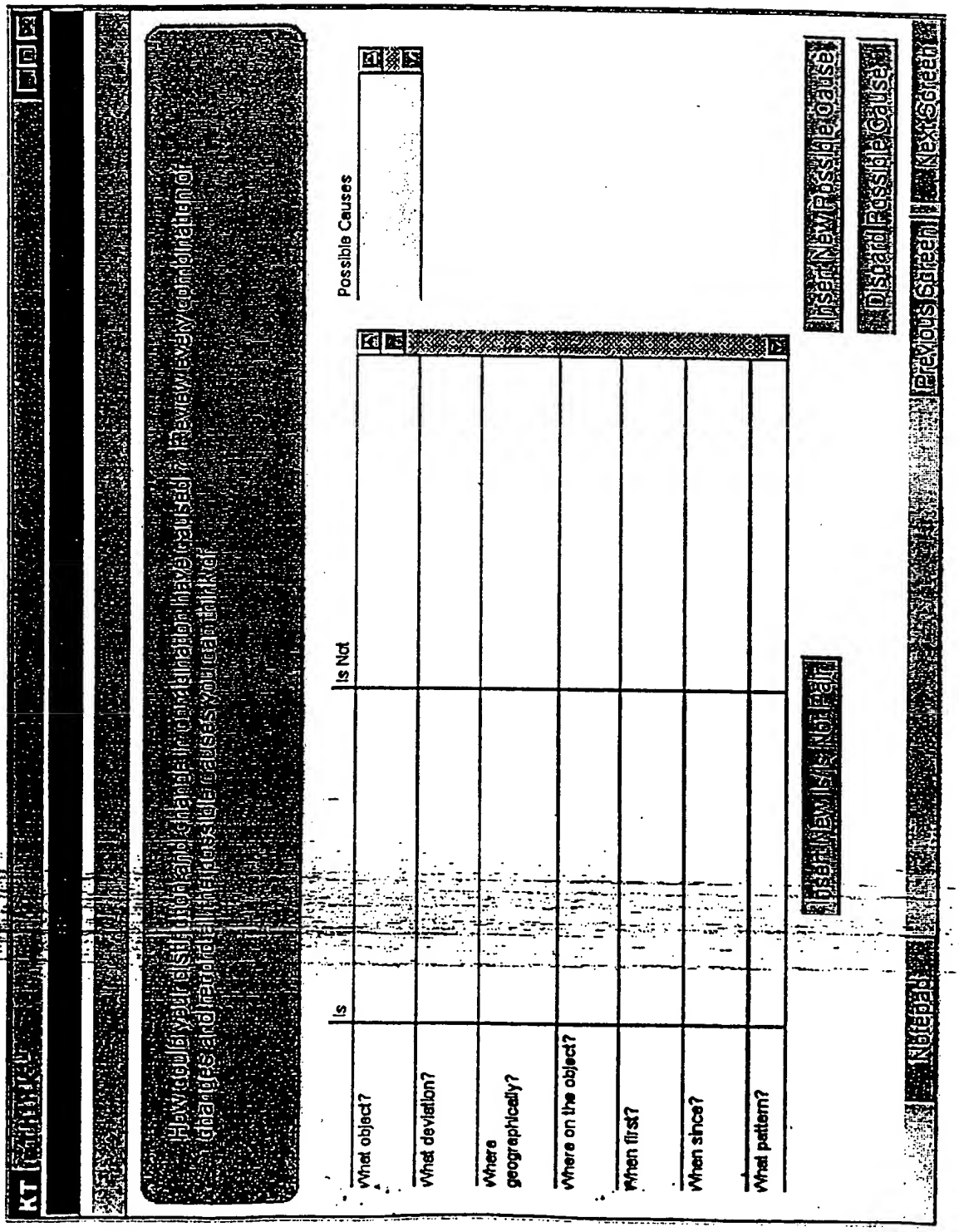

KT
Is
Is Not
What object?
What deviation?
Where geographically?
Where on the object?
When first?
When since?
What pattern?
Possible Causes
Insert New Possible Cause
Display Possible Causes
Insert New Is/Is Not Pair
Previous Screen
Next Screen
Notepad

Fig. 131

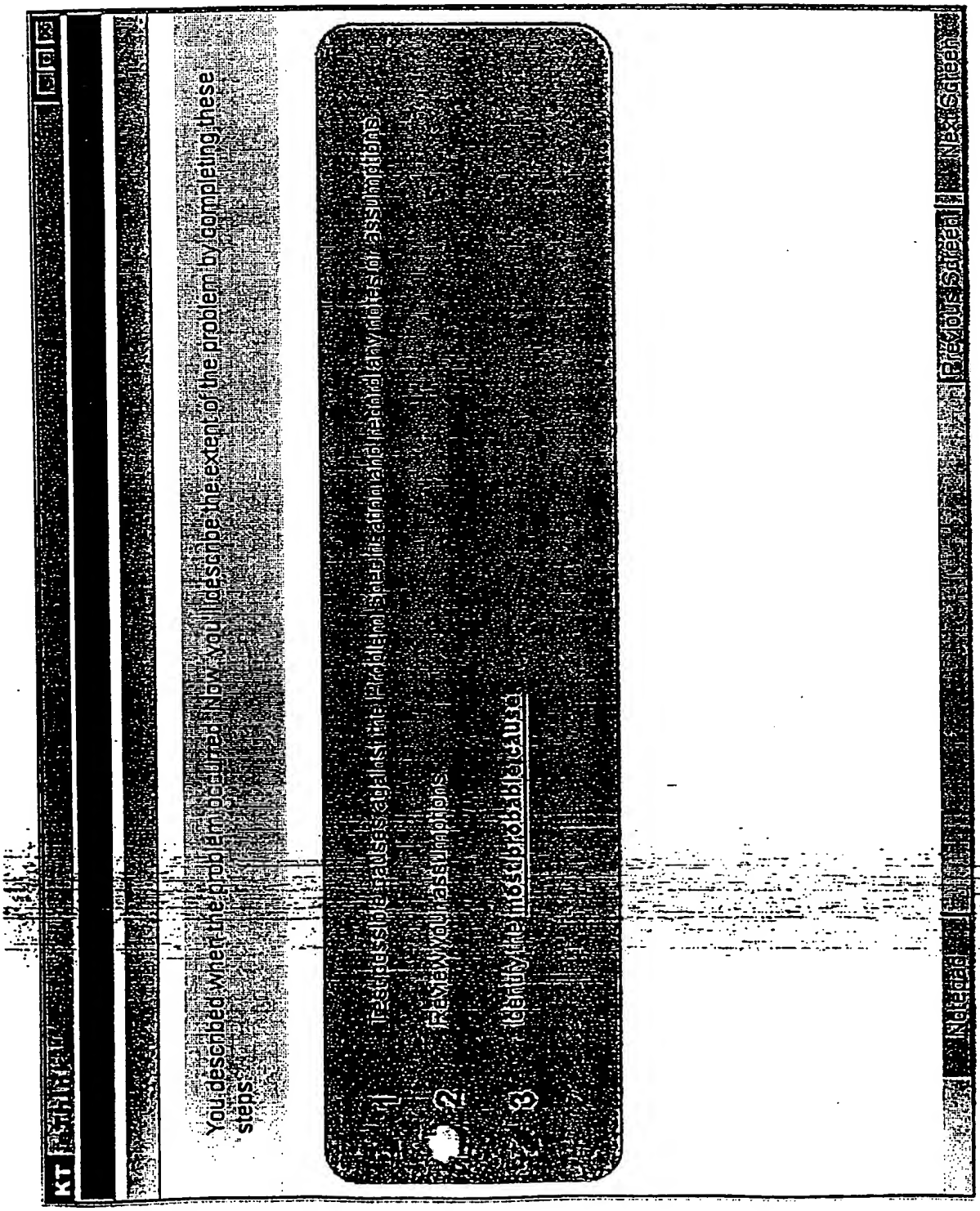

KT
You described when the problem occurred. Now you'll describe the extent of the problem by completing these steps.
1
2
3
Identify the most probable cause
Review your assumptions
Test possible causes against the Problem Specification and resolve any conflicts or assumptions
Notepad
Previous Screen
Next Screen

Fig. 132

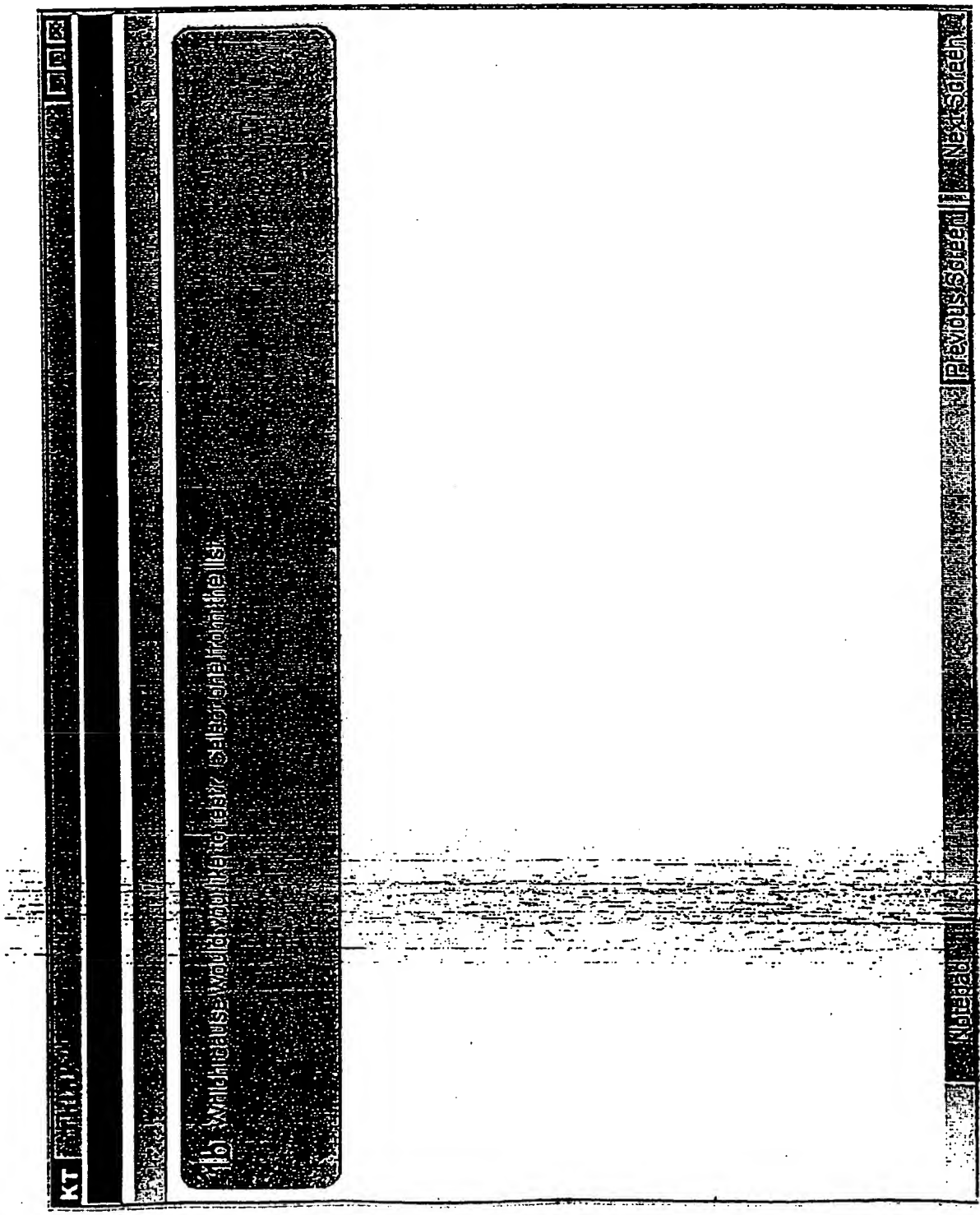


Fig. 133

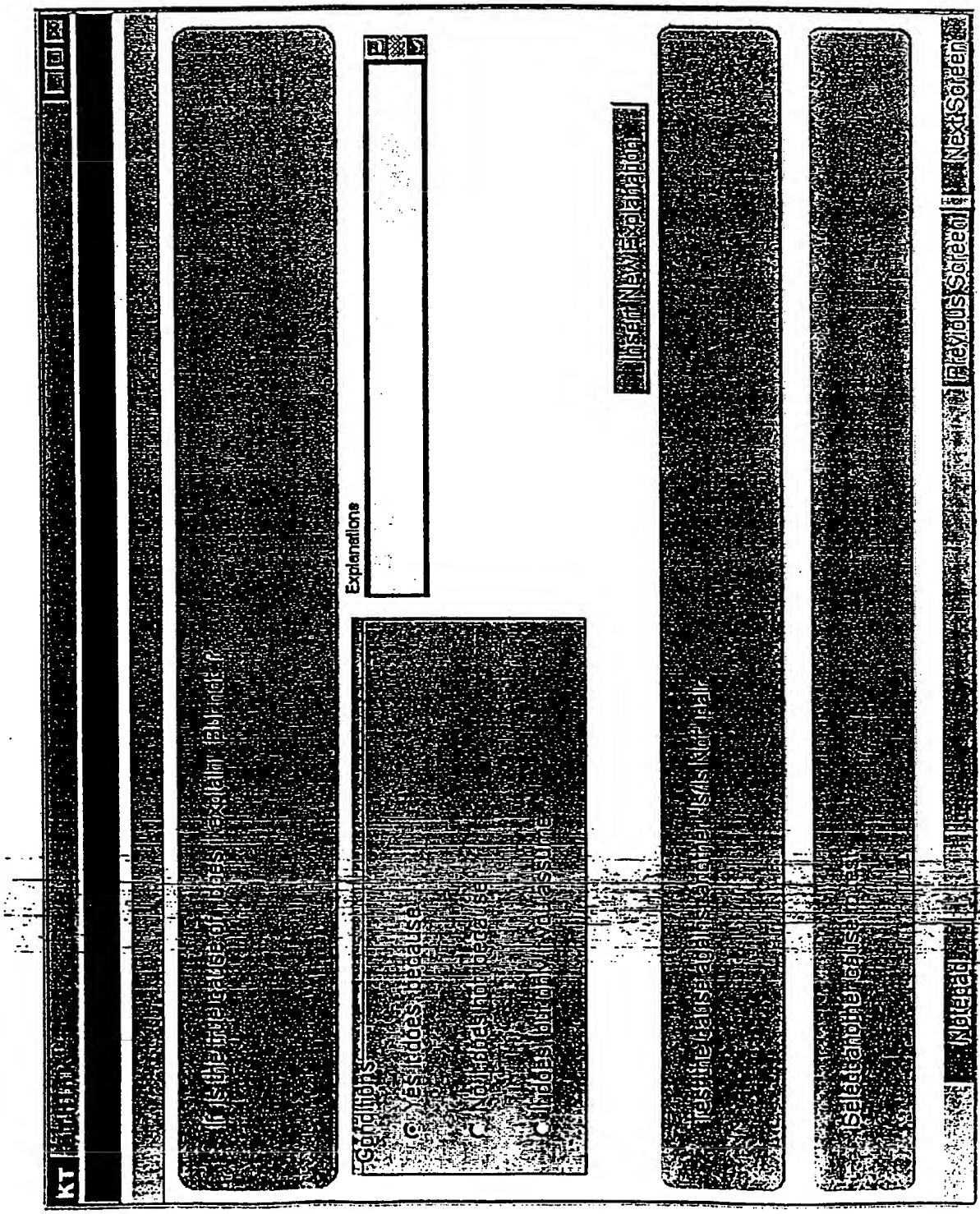


Fig. 134

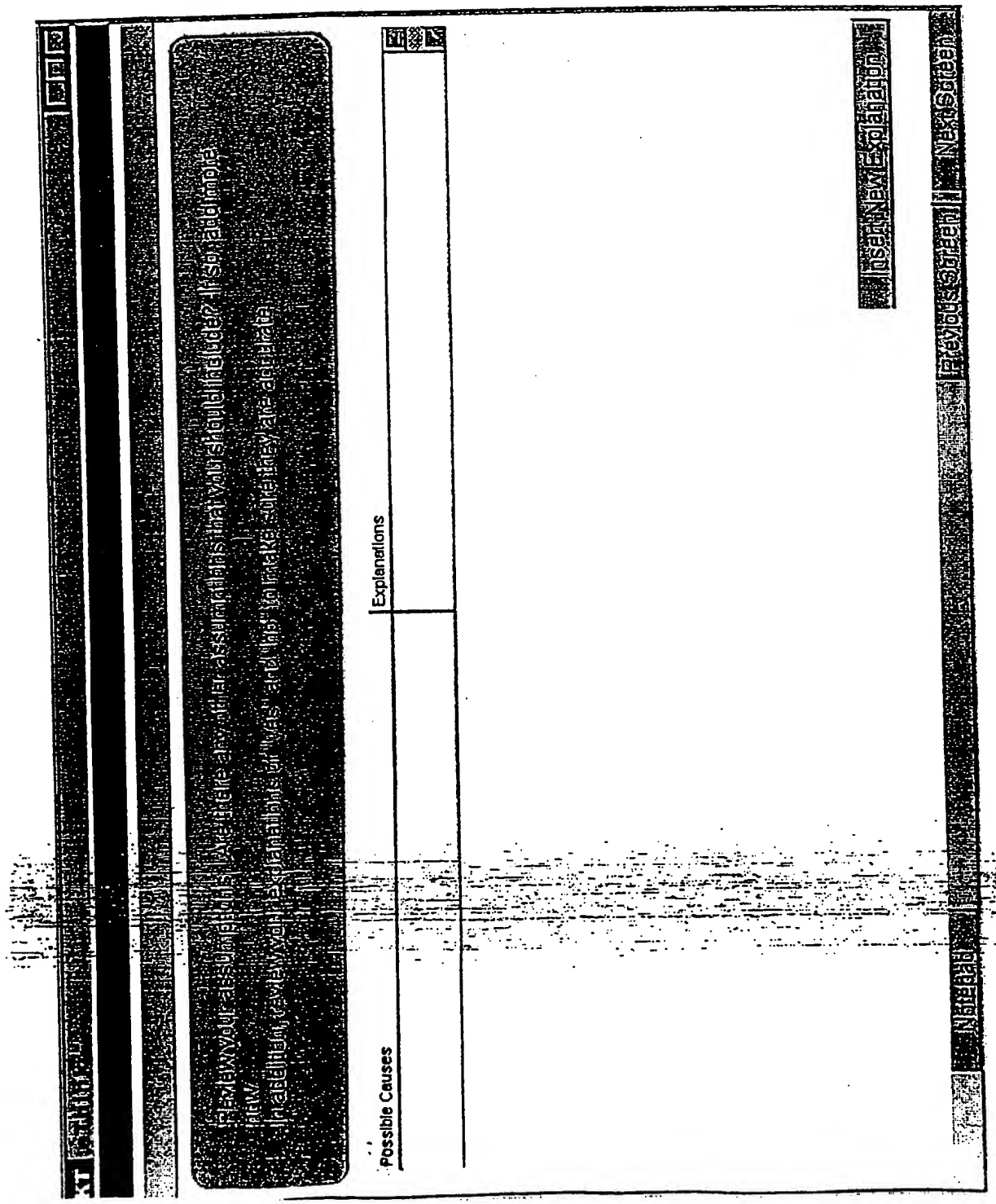

Possible Causes
Explanations
Insert New Explanation
Previous Screen
Next Screen

Fig. 135

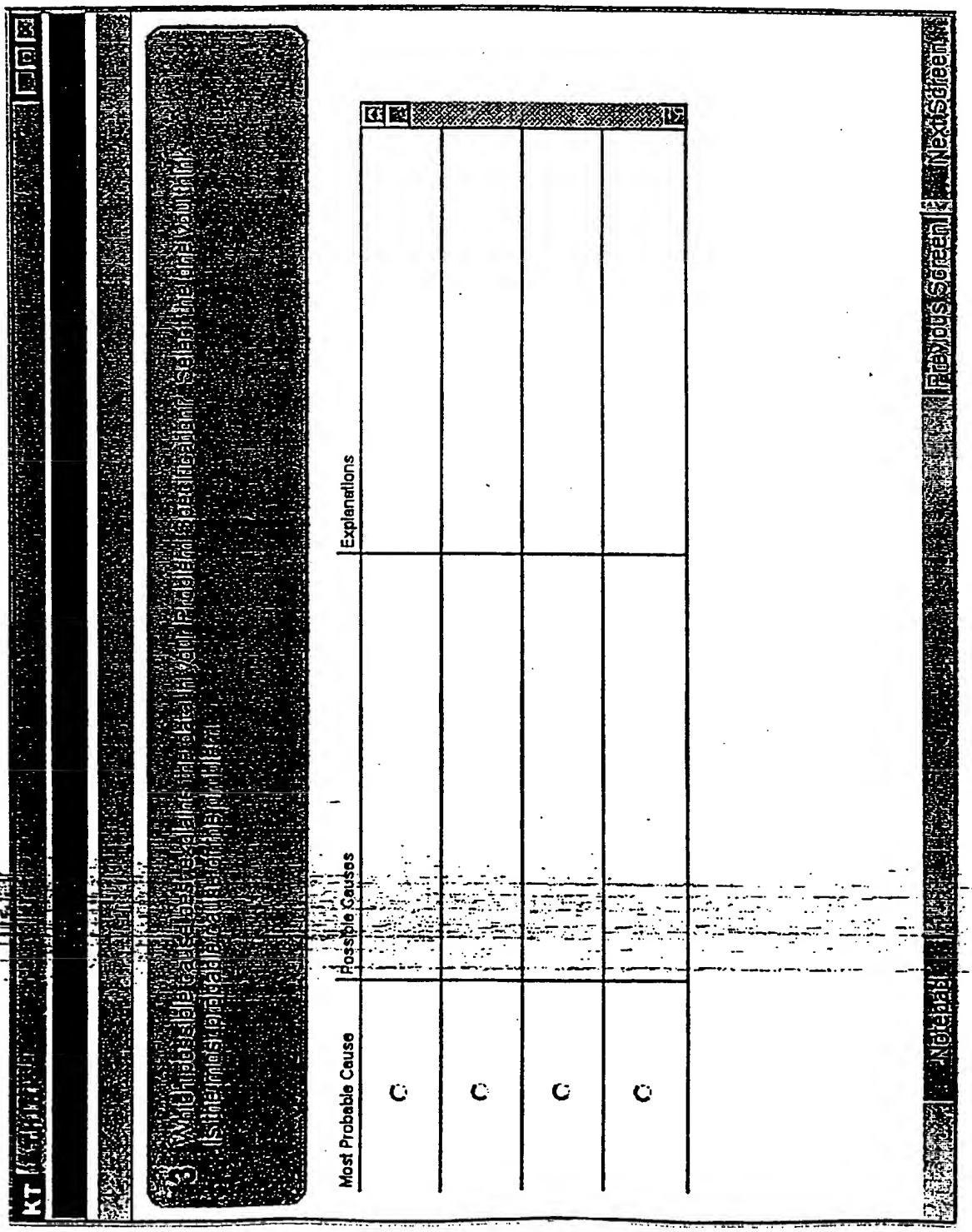

KT
Most Probable Cause
Possible Causes
Explanations
Notepad
Previous Screen
Next Screen

Fig. 136

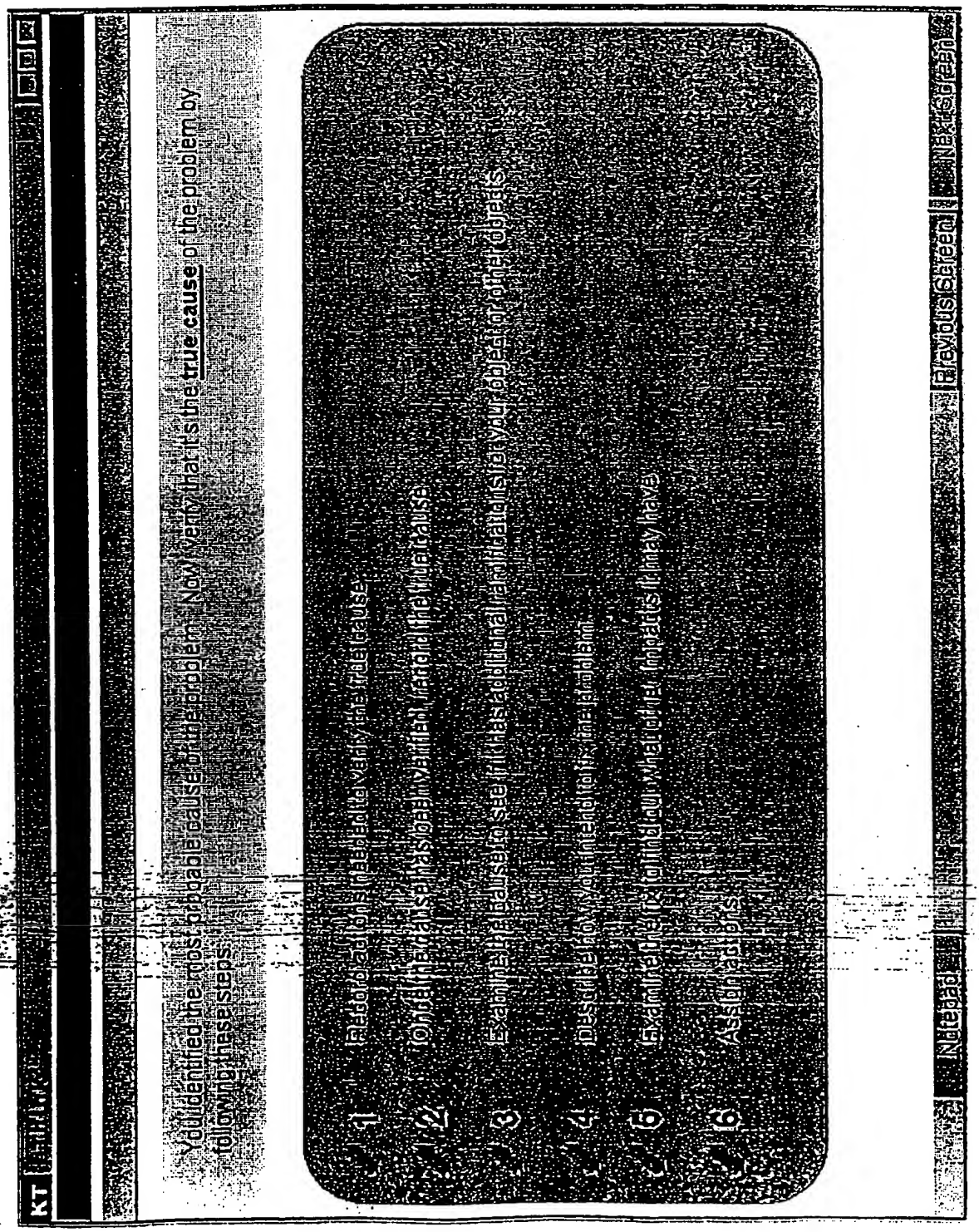

KT
You identified the most probable cause of the problem. Now verify that it's the true cause of the problem by following these steps.
1 Record actions that verify the true cause
2 Consider an alternative explanation for the true cause
3 Examine the recorded sequence for additional explanations for your observations
4 Describe how you intended to fix the problem
5 Examine the sequence for anything you might do differently next time
6 Assign actions
Notepad
Previous Screen
Next Screen

Fig. 137

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US99/15049

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :G06F 15/20, 15/22, 7/00, 17/60, 19/00, 17/30
US CL :705/1, 7, 8, 10

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 705/1, 7, 8, 10

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

APS
gathering , processing, storing, displaying, situations, problems, business, company, complex, complicated, hard

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5,237,497 A (SITARSKI) 17 August 1993, col. 3, lines 35-52 col. 4, lines 19-54.	1-3
Y	US 5,331,545 A (YAJIMA et al) 19 July 1994, figures 1-4.	1-3
A,E	US 5,937,389 A (MAXWELL) 10 August 1999, col. 4, lines 10-67	1-3
A	US 5,737,727 A (LEHMANN et al) 07 April 1998, col. 7-67	1-3
A	US 5,675,745 A (OKU et al) 07 October 1997, col. 4, lines 3-65	1-3
A	US 5,521,814 A (TERAN et al) 28 March 1996, col. 4, lines 8-65.	1-3

[X] Further documents are listed in the continuation of Box C. [ ] See patent family annex.

*	Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A"	document defining the general state of the art which is not considered to be of particular relevance	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E"	earlier document published on or after the international filing date	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&"	document member of the same patent family
"O"	document referring to an oral disclosure, use, exhibition or other means		
"P"	document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search	Date of mailing of the international search report
12 AUGUST 1999	20 OCT 1999

Name and mailing address of the ISA/US	Authorized officer
Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231	TODD VOELTZ James R. Matthews
Facsimile No. (703) 305-3230	Telephone No. (703) 305-2200

Form PCT/ISA/210 (second sheet)(July 1992)*

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US99/15049

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5,321,605 A (CHAPMAN et al) 14 June 1994, col. 2, lines 49-68.	1-3